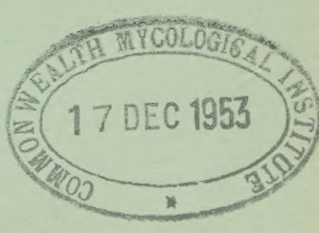
DETAILED ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE DEPARTMENT OF AGRICULTURE MADRAS

FOR

1944–45

PRINTED BY THE SUPERINTENDENT
GOVERNMENT PRESS
MADRAS
1951



DETAILED ADMINISTRATION REPORTS OF SUBORDINATE OFFICERS OF THE DEPARTMENT OF AGRICULTURE, MADRAS, FOR 1944–45.

DETAILED REPORT OF THE GOVERNMENT AGRICULTURAL CHEMIST FOR THE YEAR 1944–45 (FASLI 1354).

I submit herewith the detailed report of the working of the Government Agricultural Chemist's section during the fasli year 1944–45.

I was in charge of the section throughout the year. The increase in the number of admissions to the College necessitated the appointment of extra staff, and Sri M. R. Balakrishnan was promoted to the newly created post of Gazetted Assistant in Chemistry from 17th July 1944. Sri V. V. K. Sastri was appointed Chemist in the Scheme for the Collection and Production of Rubber from Cryptostegia grandiflora, and took charge of his post on 2nd March 1945. Control of the work of the Rubber Botanist was at the same time transferred from the Lecturer in Botany to the Government Agricultural Chemist.

I have to submit at the outset that the work of the section could not proceed at the normal pace owing to continued withdrawal of experienced assistants from the section due to exigencies of the war situation. Several items of research proposed to be taken up during the year could not either be started at all, or having been started could not be worked out to completion owing to serious shortage of hands.

The work of the section is, as usual, reported under three major heads: I. General including Analytical and Advisory work, II. Teaching and III. Research on problems of Soil Science, manuring, plant and animal nutrition, microbiology and agricultural industries.

I. General.

Weather.—The usual meteorological observations continued to be taken daily at 8·00 hours Indian Standard Time at the observatory attached to the Institute. The table below gives a summary of the records maintained during the period 1st April 1944 to 31st March 1945.—

TABLE I.—*Meteorolgical data for* 1944–45.

Year and month.	Temperature of.						Relative Humidity at 8 a.m.			Rainfall in inches.			Number of rainy days.	Wind (Mean)		
	Absolute maximum.	Absolute actual minimum.	Mean maximum.	Departure from normal.	Mean minimum.	Departure from normal.	At 8 a.m.	Mean for the month.	Departure from normal.	Actual for the month.	Mean for the month.	Departure from normal.		Actual for the month.	Mean.	Departure from normal.
	°F	°F	°F	°F	°F	°F	PER-CENT.	PER-CENT.	PER-CENT.	INCHES.	INCHES.	INCHES.		M.P.H.	M.P.H.	M.P.H.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
1944—																
April	99·0	68·9	95·3	— 0·3	72·7	— 0·4	71·0	71·1	— 0·1	2·16	1·88	+ 0·28	5	0·3	2·6	— 2·3
May	97·8	69·0	94·9	— 0·1	74·2	+ 0·2	69·7	70·2	— 0·5	2·73	2·60	+ 0·13	3	1·0	3·7	— 2·7
June	93·0	70·7	90·1	+ 1·1	73·2	+ 0·1	67·5	69·5	— 2·0	0·34	1·48	— 1·14	1	3·4	7·4	— 4·0
July	90·7	70·1	83·6	— 2·9	71·0	— 1·3	68·6	71·9	— 3·3	1·87	2·08	— 0·21	4	5·4	8·6	— 3·2
August	92·3	69·8	89·6	+ 2·7	72·5	+ 1·4	71·8	74·0	— 2·2	0·47	1·19	— 0·72	2	2·8	7·0	— 4·2
September	93·2	65·8	89·2	— 0·3	70·8	+ 0·3	76·0	73·5	+ 2·5	2·99	1·79	+ 1·20	7	1·2	5·3	— 4·1
October	93·7	67·2	88·7	+ 1·2	71·4	+ 1·0	78·0	79·9	— 1·9	6·42	5·70	+ 0·72	6	1·1	2·8	— 1·7
November	89·2	64·7	83·4	— 1·1	70·0	+ 1·5	87·8	80·6	+ 7·2	11·84	4·80	+ 7·04	12	0·8	2·2	— 1·4
December	86·8	56·7	82·1	— 1·7	66·2	+ 1·1	82·1	78·8	+ 3·3	4·75	1·49	+ 3·26	6	1·0	3·0	— 2·0
1945—																
January	89·2	55·2	85·0	— 0·9	63·2	— 1·0	76·1	76·2	— 0·1	Nil.	0·70	— 0·70	Nil	0·8	3·0	— 2·2
February	95·2	57·2	90·6	+ 0·1	66·2	+ 0·4	69·0	71·9	— 2·9	0·01	0·52	— 0·51	Nil	0·9	2·8	— 1·9
March	98·9	61·8	95·6	+ 0·8	68·8	— 0·9	62·4	69·7	— 7·3	Nil.	0·81	— 0·81	Nil	1·5	2·7	— 1·2
									Total ..	33·58	25·04	+ 8·54				

The south-west monsoon was weak, the rainfall recorded during the months of June, July and August being below the normal by 1·14, 0·21 and 0·72 inches, respectively. The north-east monsoon more than compensated for this, the heaviest rainfall during the period (11·84 inches) having been recorded in the month of November. The total rainfall for the year ending 31st March 1945 was 33·58 i.e., 8·54 inches above the normal.

Analytical and Advisory.—The analysis of soils, manures, irrigation waters, foodstuffs, fodders, sugarcane juices and miscellaneous products relating to Agriculture for Government Departments as well as ryots, business concerns and other private parties, formed as usual the main feature of this branch of the section during the year. Two thousand one hundred and seventy-nine samples of all descriptions were received and registered. The number analysed and reported on totalled 2,081, as classified below according to the nature of samples and source of receipt.

TABLE II.

Nature of sample.	*Source of receipt.*				
	Research.	*Agricultural Department.*	*Other Government Departments.*	*Ryots and private parties.*	*Total.*
Soils	50	67	237	6	360
Manures	22	66	5	69	162
Foods and Fodders ..	23	46	56	13	138
Waters	17	22	1,050	3	1,092
Sugarcane Juice	3	218	..	..	221
Miscellaneous	4	35	63	6	108
Total ..	119	454	1,411	97	2,081

Besides offering to the respective parties technical advice based on the results of these analyses, numerous enquiries from Government departments and members of the public relating to the activities of the section were also answered.

A sum of Rs. 837 was received during the year as analytical fees from ryots and other private parties.

Of the samples analysed and investigations carried out in the branch, the following deserve special mention :—

(1) The periodical analysis of water samples collected at different points in the Stanley Dam at Mettur, with a view to collect data on silt accumulation, was continued throughout the year. Nine hundred and ninety-five samples were examined for total and suspended solids and the results reported to the Public Works Department.

(2) One hundred and seventy six samples of earth received from the Public Works (Irrigation) Department were tested for suitability for tank beds and bunds in connexion with extension

of irrigation works and growing more food crops. The examination consisted in mechanical analysis and estimation of soluble salts and PH, which would lead to evidence regarding the formation of sodium clay, making the soil impervious to water and reducing see page losses.

(3) Twenty seven samples of Godavari water and 6 samples of silt collected at different points in the Polavaram Reservoir Project were analysed for the Executive Engineer in charge of this project. The water samples had low soluble salt contents and were well suited for irrigation purposes. The silt samples had a sufficiency of organic matter and essential plant foods, and did not contain soluble salts to an extent injurious to plant growth.

(4) Thirty-four samples of cattle food, consisting of groundnut cake, rice bran, wheat bran, cotton seed, ragi flour, and bengal gram husk, were analysed for their relative feeding values at the instance of the Livestock Development Officer, Hosur, in connexion with the acceptance of tenders for supply during the year 1945–46. Selections were made from samples of each group with regard to quality and feeding value.

(5) Two samples of vinegar, prepared out of coconut toddy, one at the Agricultural Station at Kasaragod and the other at Pilicode, were received for analysis from the Oilseeds Specialist. The Kasaragod sample was good quality vinegar with 5·4 per cent acetic acid and low total solids and ash contents.

(6) A sample of clean groundnut cake meal prepared by a Firm at Kolhapur and intended for human consumption was received from the Oilseeds Specialist for analysis. Its food value is given below :—

TABLE III.

	PER CENT.
Moisture	6·49
Ash	4·21
Crude Protein	51·63
Ether Extractives	9·15
Crude Fibre	3·89
Carbohydrates	24·63
Total	100·00
Insolubles	0·18
Phosphoric acid (P_2O_5)	1·58
Lime (CaO)	0·23
Acid value	32·5

The sample was rich in protein and phosphoric acid. Bread, biscuits, etc., prepared from flour into which this cake meal is incorporated to the extent of about 25 per cent can be expected to possess high nutritive value.

(7) A sample of ' Rycena ' was received from the Commissioner for Civil Supplies for analysis and report. ' Rycena ' was wheat from which most of the gluten was removed, and was being used as a substitute for rice in Ceylon. The food value of the sample is given below, as compared with that of wheat and rice:—

TABLE IV.—*Results expressed on 100 parts dry matter.*

Heads of analysis.	*Rycena as received.*	*Rice.*	*Rycena.*	*Wheat.*
Moisture	12·47	..	..	..
Ash	0·92	1·02	1·05	2·56
Crude Protein	9·95	7·73	11·37	18·74
Crude Fibre	0·97	0·46	1·11	1·69
Ether Extractives	1·20	0·84	1·37	2·69
Carbohydrates (by difference) ..	74·49	89·95	85·10	74·32
Total ..	100·00	100·00	100·00	100·00
Lime	0·06	0·03	0·07	0·13
Phosphoric acid	0·37	0·46	0·42	1·21

Since gluten contains most of the protein and minerals of wheat grain, its removal has resulted in a product (Rycena) which contains less of these ingredients than in wheat, and approaches rice in composition. If broken coarse, Rycena cooks readily and forms a good substitute for rice.

(8) Two samples of Derris roots, one big and the other small in size, were received from the Government Entomologist for Rotenone assay. The determination of rotenone was made by the improved crystalliation method of H. A. Jones and J. J. T. Graham. The big sized roots contained 5·52 per cent rotenone (on moisture-free basis) and the small sized ones 5·15 per cent.

(9) Samples of Digitalis leaves and Jalop tubers grown in the Government Botanical Gardens at Ootacamund were forwarded by the Curator and District Agricultural Officer, the Nilgiris, for estimation of the active principles in them. The Digitalis leaves contained 0·378 per cent of digitoxin and the Jalop tubers contained 13·17 per cent of resin. Both were up to the specification given in the British Pharmacopoea as regards their contents of active principles.

(10) An investigation was made into the causes that led to the widely varying nitrogen content of Safflower cake. The average analysis of three samples of cake (from Bellary) reported to have been obtained from decorticated seed worked out to 13·14 per cent moisture, 8·40 per cent nitrogen, and 5·51 per cent ether extractives. The average figures for cake from undecorticated seed were, 13·06 per cent moisture, 7·47 per cent nitrogen and 7·83 per cent ether extractives, the difference being obviously due to the different amounts of shell retained in the seed at time of crushing. To work out the possible limits of variation in the nitrogen content of this cake, a sample of Safflower seeds was obtained from Bellary

and subjected to analysis both as whole seed and as kernels and shell separately. The results are given below :—

TABLE V.

	Whole seed.	Shelled.	
		Kernel.	Shell.
Moisture	8·85	9·48	..
Nitrogen	2·85	5·37	0·68
Ether extractives	29·12	54·83	..

Calculated on the average moisture and oil contents of cake from decorticated and undecorticated seeds, the possible limits of variation of the nitrogen content of Safflower cake obtained in the Bellary district worked out to 3·5 per cent for cake from undecorticated seed and 10·8 per cent in the case of that prepared from decorticated seed. It is, therefore, possible to prepare a cake of higher protein value than groundnut cake from well decorticated safflower seeds.

(11) The food value of hill types of redgram as compared with that of the cultivated variety and the possibility of substituting it for the latter in ordinary South Indian preparations formed the subject of another investigation. Samples of hill type seeds were obtained from Parvatipuram, Salur and Cannanore. Seeds of these wild varieties were larger in size than the ordinary redgram seeds, and their seed coats were thicker and differently coloured being light grey, red, black or mottled. Dhal was prepared out of these samples as well as from the ordinary variety obtained from the Pulses Specialist, by the usual process of soaking covering with red earth, drying and crushing, in a stone mill. The chemical analysis of the dhals thus obtained is given in the following table :—

TABLE VI.

Heads of analysis.	Analysis of split gram—"Dal" (Husked).							
	Dhal from samples of red gram got from Pulses Specialist.		Dhal from Cannanore. Hill type.		Dhal from Parvatipuram. Hill type.		Dhal from Salur Hill type.	
	Air dry sample.	Dry basis.	Air dry sample.	Dry basis.	Air dry sample.	Dry basis.	Air dry sample.	Dry basis.
Moisture	9·26	..	9·01	..	10·35	..	10·21	..
Ash	4·88	5·37	4·10	4·51	2·52	2·81	1·73	1·93
Crude Proteins	25·77	28·41	24·08	26·47	23·97	26·75	22·55	25·12
Ether Extractives	1·56	1·72	1·32	1·45	2·26	2·52	2·37	2·64
Crude fibre	1·49	1·64	1·89	2·08	1·40	1·56	1·12	1·25
Carbohydrates by difference.	57·04	62·86	59·60	65·49	59·50	66·36	62·02	69·06
Total ..	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Insolubles	0·13	0·14	0·91	1·00	0·31	0·35	0·043	0·048
Lime (CaO)	0·14	0·16	0·19	0·21	0·13	0·15	0·12	0·13
Phosphoric acid (P_2O_5) ..	0·88	0·97	0·88	0·97	0·52	0·58	0·38	0·42

The figures show that the hill types were also rich food, though slightly lower in protein content than the cultivated variety. The real difficulty in utilising these wild types was the long time they took for cooking, even in distilled water or other water of high purity. Pre-treatment like soaking in water for an hour, roasting or coarsely grinding before cooking, had no effect. Chemical treatment which consisted in adding small quantities of

sodium bicarbonate had the effect of softening the dhal, but the quantity of this chemical required for cooking in a reasonable time was about 0·5 gram and this quantity affected the colour and flavour of the cooked product. However, the hill types could be used as substitutes for ordinary redgram dhal in preparations like 'vadai' where it is soaked, ground to paste and fried. They may also be roasted and ground into condiment powders for use with rice.

(12) A preliminary investigation was made on the possiblity of preparing milk substitutes from vegetable sources such as oilseeds and pulses. The physical properties and chemical composition of milk prepared out of blackgram, horsegram, bengalgram, lab-lab, groundnut, coconut and cotton seed were studied in detail. The pulses, it was observed, imparted their characteristic odour and flavour to the milks prepared from them, which were generally repulsive either taken alone or mixed with beverages like tea or coffee. Of the oilseeds, coconut and cotton seed milks did not possess any unpleasant flavour. Coconut milk had a high fat content, but was poor in protein. Cotton-seed milk was similar in composition to cow's milk. Its digestibility and toxicity, if any, have to be further studied before it is recommended for general use. The chemical composition of milk substitutes prepared from the above sources is given below :—

TABLE VII.—*Comparative date on the composition of milk made from different seeds.*

Source of milk.	*Specific gravity (29°C).*	*Moisture.*	*Ash.*	*Protein.*	*Fat.*	*Carbo hydrates.*
Cotton seed	1·020	88·04	0.85	4·42	4·98	1·71
Coconut	0·997	79·33	0·50	1·68	16·15	2·34
Groundnut	1·018	72·22	0·64	6·79	14·40	5·95
Blackgram	0·945	97·47	0·18	1·02	0·61	0·72
Lab-Lab	1·028	90·50	0·75	5·32	0·54	2·89
Bengal gram	1·024	90·72	0·31	3·04	0·52	5·41
Cow's Milk	1·030	87·30	0·80	3·20	3·50	5·20
Soya bean milk		87·03	0·52	2·40	3·15	6·90

II.—TEACHING.

As a consequence of the increase in the number of admissions to double the original strength, the practical classes had to be conducted in batches. There was otherwise no change. The following statement gives the number of lectures delivered and practical classes held during the academic year 1944–45 :—

Class.	Subject.	Number of classes.
B.Sc. (Ag.) First year class.. ..	Theory ..	60
Do.	Practical ..	121
B.Sc. (Ag.) Second year class ..	Theory ..	52
Do.	Practical ..	28
B.Sc. (Ag.) Third year class. ..	Theory ..	121
Do.	Practical ..	92

No admissions were made for the short course in agriculture during the year.

Post-graduate course of studies.—Two research students were admitted early in July and September 1944 and a third in January 1945. They were given preliminary training in routine methods of analysis and are now engaged on the following items of work :—

(1) S. Venkatachalam—Chemical basis of resistance—a study of the resistance of the paddy plant to *Pyricularia.*

(2) L. S. Balasubramaniam—Fat constituents of cholam grain and the study on their oxidation products.

(3) Ramarajan—Soil phosphates—their chemical character and formation from added fertilizers.

III.—Research.

A. *Soils.*

1. *Fundamental studies on the origin and properties of black and red soils of the Madras Presidency.*—This investigation has been in progress during the past two years. The characteristics of black and red soils formed from different geological formations being studied in detail with regard to their profile characters, soluble salts, chemical composition of their clays, SIO_2/R_2O_3, molar ratios, etc. The study of black soils from cretaceous formations was taken up during the year. The Ariyalur area situated in the Tiruchirappalli cretaceous belt, is composed of gritty calcareous sandstones and limestones. The black soil at places is very deep and of a rich black colour. This area is similar to the other black soils of this Presidency in soil characteristics. Small saline patches are to be met with here and there, and the soil cracks deeply and contains kankar nodules. The sub-soil water is slightly saline and contains calcium salts. The soluble salt content and pH of soil samples collected at different depths from two profile pits, one at 2½ miles south of Ariyalur and the other at Allinagaram, are given in Table VIII below :—

Table VIII.—*Table showing the soluble salt contents of the Ariyalur soil samples.*

P.C. on moisture free basis.

Lab No.	1925.	1926.	1927.	1928.	1929.	1930.	1931.	1932.	1933.
	(A) pit 2½ miles south of Ariyalur.						B. Allinagaram.		
	0—1.	1′—2′.	2′—3′.	3′—4′.	4′—5′.	5′—6′.	0—12″.	12″—24″	36″—48″
Total solids ..	·054	·143	·287	·350	·475	·840	0·62	·094	1·27
Ca $(HCO^3)_2$ ..	·044	·048	·044	·054	·084	·062	0·25	·017	·038
Mg $(HCO^3)_2$ ..	..	..	..	..	..	..	..	·017	·024
$NaHCO_3$ ..	·004	..	..	..	..	..	·032	·034	..
CaS04	..	·012	·039	·014	·026	·163	..	..	..
MgS04	..	..	·0195	·017	·041	·075	..	..	·015
Na_2S0_4 ..	·006	..	·027	·05	·133	·376	..	..	·246
Nacl	·009	·093	·193	·216	·236	·206	·005	·004	·941
pH	8·68	8·28	8·30	8·14	8·22	7·53	8·75	9·32	8·62

In pit A the salt content increases with depth ; gypsum is found from the second foot downwards, the quantity increases with depth and reaching to 0·16 per cent at the sixth foot. The soil

is thus similar to the black soils with gypsum found in other parts of the Presidency. In pit B near Allinagaram the lower depths (3′ — 4′) contain plenty of soluble salts, composed mainly of sodium sulphate and chloride.

The mechanical fractions from these soils are being separated and analysed chemically.

A study was also made of the low temperature dehydration of clay fractions of red and black soils. Four clay samples (2 red and 2 black) were subjected to dehydration at temperatures from 35°C to 100°C at intervals of 5°C till constant weights were obtained at each stage. The data obtained show that all the clays are similar in behaviour up to a temperature of 45°–50° C. The red clays however have lower moisture absorption (from the atmosphere) capacity than the black clays. The poor absorption capacity of the red soils and the higher absorption capacity of black soils are more due to the nature of their clays than to their absolute clay contents.

2. *Soil survey of the Gandikota project area.*—In order to utilise the flood waters of the Pennar river for the raising of dry crops it has been proposed to construct a dam across the river at Gandikota in Jammalamadugu taluk, Cuddapah district. To assess the suitability of soil and irrigation water for the raising of dry crops, it was thought desirable to open a farm in a typical locality for the conduct of irrigation experiments. The periodical analysis of flood waters of the Pennar revealed the presence of injurious salts like sodium bicarbonate and chloride as its main constituents, with a view to collect data on the composition of the soil to be irrigated a rapid traverse was made over the area comprising Jammalamadugu, Peddapasupula and Salavari-Uppalapadu, and typical soil samples were collected from 8 profile pits. The results of analysis of these samples are given in Tables IX and X below :—

TABLE IX.—*The results of mechanical analysis of* 21 *soil samples Nos.* 1160—1180 *of* 1944–45 *collected from Jammalamadugu area in connexion with the Gandikota Project.*

Results on dry basis.

Pit. number.	Lab. No.	Clay.	Silt.	Fine sand.	Coarse sand.	Acid solubles.	Total.
A	1160	48·80	16·72	14·07	12·25	8·16	100·00
	1161	52·50	16·24	14·29	9·39	7·58	100·00
	1162	57·00	18·12	12·29	7·24	5·35	100·00
	1163	20·42	6·91	16·06	57·69	..	101·08
	1164	30·57	12·28	14·32	37·74	5·09	100·00
B	1165	35·29	14·54	13·24	32·13	4·80	100·00
	1166	47·11	17·76	11·82	20·76	2·55	100·00
	1167	47·53	20·82	11·80	16·02	3·83	100·00
	1168	50·01	21·59	11·22	16·06	1·12	100·00
C	1169	21·41	24·42	18·22	32·88	3·12	100·00
	1170	30·31	14·70	15·81	25·82	4·36	100·00
D	1171	47·12	18·13	14·89	16·49	3·37	100·00
	1172	48·91	13·96	14·86	17·05	5·22	100·00
E	1173	33·95	12·25	12·57	39·26	3·97	100·00
	1174	35·65	11·01	12·06	38·79	2·49	100·00
F	1175	40·86	17·17	12·11	26·85	3·01	100·00
G	1176	43·75	13·79	11·14	28·64	2·68	100·00
	1177	43·31	15·94	13·29	26·04	1·42	100·00
	1178	49·33	15·01	13·51	19·84	2·31	100·00
H	1179	52·56	14·90	13·76	17·27	1·51	100·00
	1180	58·49	15·68	10·71	11·48	3·61	100·00

TABLE X.—*Water soluble salts in 21 soil samples (1160—1180 of 1944–45) taken from Jammalamadugu area in connexion with the Gandikota Project.*

Percentage on dry basis.

Depth. ft. in.	Lab. No.	Total solids.	$CaCO_3$.	$Ca(HCO_3)_2$.	$Mg(HCO_3)_2$.	Na_2CO_3.	$NaHCO_3$.	Na_2SO_4.	NaCl.	pH.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A. 0—12	1160	·107	0·46	·019	..	..	·059	·005	·020	9·53
12—24	1161	·152	..	·075	..	..	·094	·009	·021	9·56
24—30	1162	·144	..	..	·018	..	·128	·025	·036	9·42
B. 0—12	1163	·072	..	·026	..	..	·041	·008	·071	9·88
12—24	1164	·119	·008	·017	·007	..	·110	..	·008	10·04
24—36	1165	·184	·003	·037	..	..	·092	..	·049	9·9
36—48	1166	·375	..	·046	..	..	·054	·131	·142	9·48
48—60	1167	·710	..	·037	..	..	·051	·508	·165	9·33
60—66	1168	·895	..	·093	0·057	..	..	·792	·086	9·30
C. 0—12	1169	·109	..	..	..	·008	·109	..	·015	9·35
12—28	1170	·256	·005	·024	..	..	·198	·051	·067	9·22
D. 0—12	1171	·908	·005	·020	..	..	·085	..	·006	9·52
12—20	1172	·190	..	..	..	·006	·195	..	·013	9·64
E. 0—12	1173	·123	..	·020	..	..	·131	..	·012	9·53
12—18	1174	·192	·005	·014	..	..	·136	..	·023	9·65
F. 0—15	1175	·289	..	..	..	·005	·202	·088	·058	9·56
G. 0—12	1176	·133	..	·032	..	..	·098	..	·012	9·40
12—18	1177	·194	..	..	..	·005	·178	..	·002	9·62
H. 0—12	1178	·192	·005	·014	..	..	·218	..	·010	9·8₂
12—24	1179	·236	·005	·014	..	..	·256	..	·035	9·78
24—30	1180	·344	·010	·014	..	..	·242	·080	·139	9·32

The soils are typical deep black cotton soils similar to those of Nandyal. They are very clayey except along the banks of the Pennar where exists a top layer of sand blown from the river. The figures in the tables show that the soluble salt content is high even in the surface soil and increases with depth. Sodium bicarbonate is the predominant salt and has caused the high pH observed in all the layers. The composition of the soil and the water create a special problem and call for extreme caution in the introduction of irrigation in these areas. A separate report on the soil survey has been submitted.

Studies on cultural practices in relation to soil structure.—One of the fundamental problems of soil management is the creation of soil tilth. Soil tilth is a practical agricultural term referring usually to the state of the seed bed. It is not yet possible to describe in scientific terms the exact conditions prevailing when a soil is in good tilth although it is admitted that tilth is a function of both texture and structure. In order to arrive at a quantitative measurement of soil tilth, three main types of analyses are

usually conducted, namely, determination of permeability, porosity and aggregate distribution in the soil.

The study of the aggregate distribution in the soil was taken up on soil samples taken from plots under cultural experiments in Field Nos. 10 C (red soils) and 11 B (black soils) of the Cotton Breeding Station, Coimbatore. The treatments received by the plots were as follows :—

	Red soil.	*Black soil.*
1	No ploughing but hand hoeing and weeding was done twice.	No ploughing but hand hoeing and weeding was done twice.
2	Country ploughing, twice	Country ploughing twice.
3	Do. 4 times	Do. 4 times.
4	Do. 6 times	Do. 6 times.
5	Do. 8 times.	Do. 8 times.
6	Cooper 26 once	Cooper 26, once.
7	Do. twice	Do. twice.
8	Guntaka, once	Guntaka, twice.
9	Guntaka, twice	Standard : Victory plough once and country plough, once.
10	Standard : Victory plough once and country plough, once.	Do.

The direct sieving technique used by B. A. Keen (Physical properties of the soil by B. A. Keen, page 278), was adopted. The sieves were of standard square meshes of sides 1·5 ″,0·5″,0·25 ″ and 0·10″. The weights of the different aggregates were expressed as a percentage of the total weight of soil. A single value for "Total Surface Area" was obtained. Sampling was done at monthly intervals and the period of sieving for each fraction was 1 minute. The single value for surface area which is dependent on cultivation and rainfall has been obtained in the differently treated plots in black and red soils at monthly intervals.

The following table contains figure expressing the single value for total surface area obtained during the different months for four of the treatments.

TABLE XI.—*Total surface area.*

	Red soils.				*Black soils.*			
1944—	*No. ploughing.*	*Country plough 6 times.*	*Cooper 26 twice.*	*Standard v.p. once and c.p. once.*	*No. ploughing.*	*Country plough 6 times.*	*Cooper 26 twice.*	*Standard v.p. once and c.p. once.*
June	1,332	1,307	1,349	1,399	1,433	1,100	1,398	1,370
July	1,139	1,270	1,399	1,311	1,314	848	1,500	1,438
August	1,499	1,364	1,537	1,667	..	..	..	..
September	1,475	1,405	1,366	1,507	1,333	1,068	1,323	1,333
October	1,182	1,277	1,081	1,182	1,238	1,256	1,206	1,163
November	676	641	522	631	1,196	825	565	564
December	931	814	915	1,033	1,107	1,059	1,017	663
1945—								
January	1,616	1,019	1,275	1,121	581	1,013	925	943
February	1,270	1,061	1,200	1,180	951	842	1,058	1,182
March	1,411	1,038	1,484	1,345	1,103	866	1,205	1,048
April	1,190	1,091	1,351	1,217	1,251	1,057	1,120	1,055

3. (*a*) *Effect of season.*—When the values of the surface area are plotted with reference to season it is found that there is general similarity in the fluctuations of the surface area with respect to season in all the treatments. (Curves Nos. 1 and 2). During the crop season two maxima and one minimum are shown by these values, the maxima in August and January and the minimum in November. The minimum is obtained due to the higher percentage of larger aggregates which are formed as a result of the desiccation closely following upon the saturation of top soil during the rainy season. As the dry weather advances, after November, there is gradual disintegration of the coarse particles by natural variations of temperature and the percentage of fine particles increases towards the end of the crop season. Generally, the curves for surface area vary in the inverse ratio as the rainfall.

(*b*) *Effect of treatment.*—The following table gives the data for the total surface area before and after the treatments in the red and black soils for a few of the important treatments.

TABLE XII.—*Total surface area before and after cultivation.*

Red soil—Field No. 10-C.

Treatments.	*Before cultivation.*	*After cultivation.*	*Percentage of increase.*
Control*	1,332	1,499	12·54
Country plough, 6 times	1,307	1,364	4·36
Cooper 26, twice	1,349	1,537	13·94
Standard	1,399	1,667	19·20

* Hand hoeing.

Black Soil—Field No. 11-B.

Treatment.	*Before cultivation.*	*After cultivation.*	*Percentage of increase.*
Control (no ploughing)	1,073	1,333	19·5
Country ploughing 6, times	851	1,068	25·51
Cooper 26, twice	1,290	1,323	2·56
Standard	930	1,333	43·3

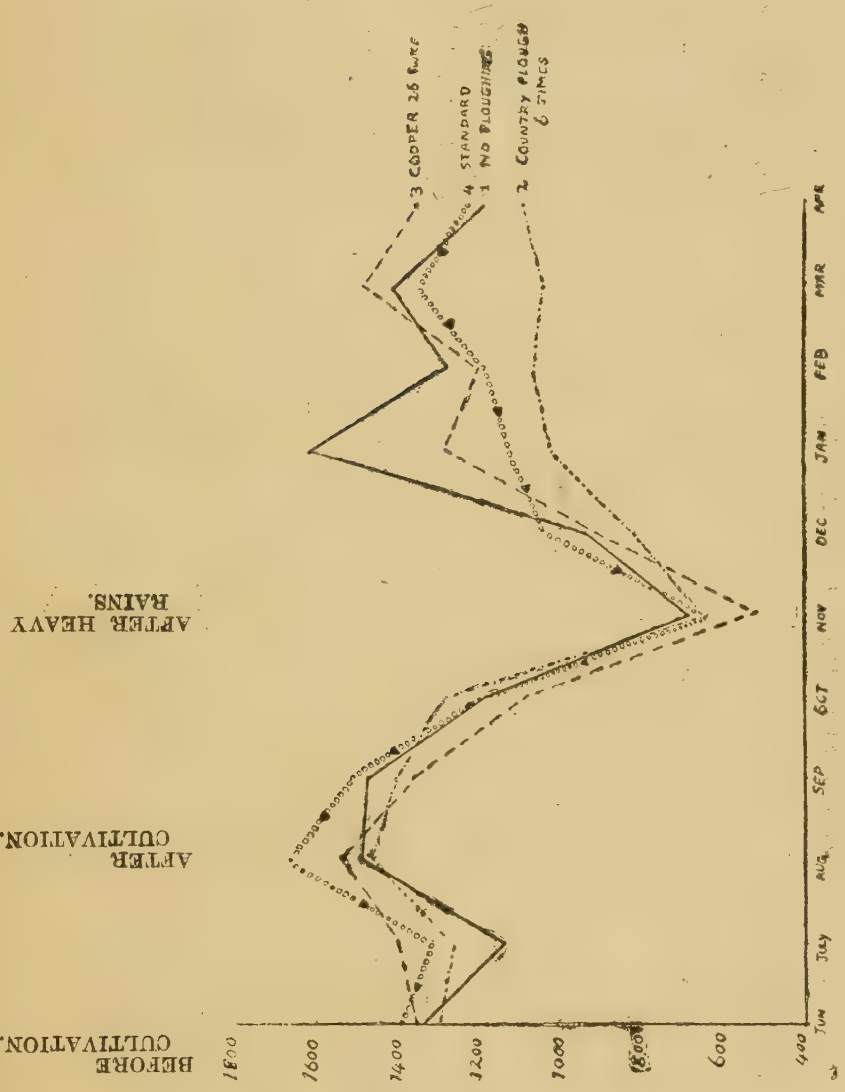
The direct effect of the different implements in breaking up clods in the red and black soils is clearly seen in the above two tables. Working the victory plough once and the country plough once (standard) has the greatest amount of pulverisation in the case of both red and black soils. The effect of the treatment is more pronounced in the case of the black soils than in the red.

4. *Soil moisture studies, Agricultural Research Station, Nileshwar.*—An experiment on burying coconut husk between rows of trees is in progress at the Agricultural Research Station, Nileshwar. This treatment has resulted in greater yield of nuts. In order to see whether the improvement is due to an increase in the moisture absorption by the soil, soil moisture studies were started in December 1944. Samples of soil were drawn at monthly intervals.

CURVE No. 1.

TOTAL SURFACE AREA, 1944–45.

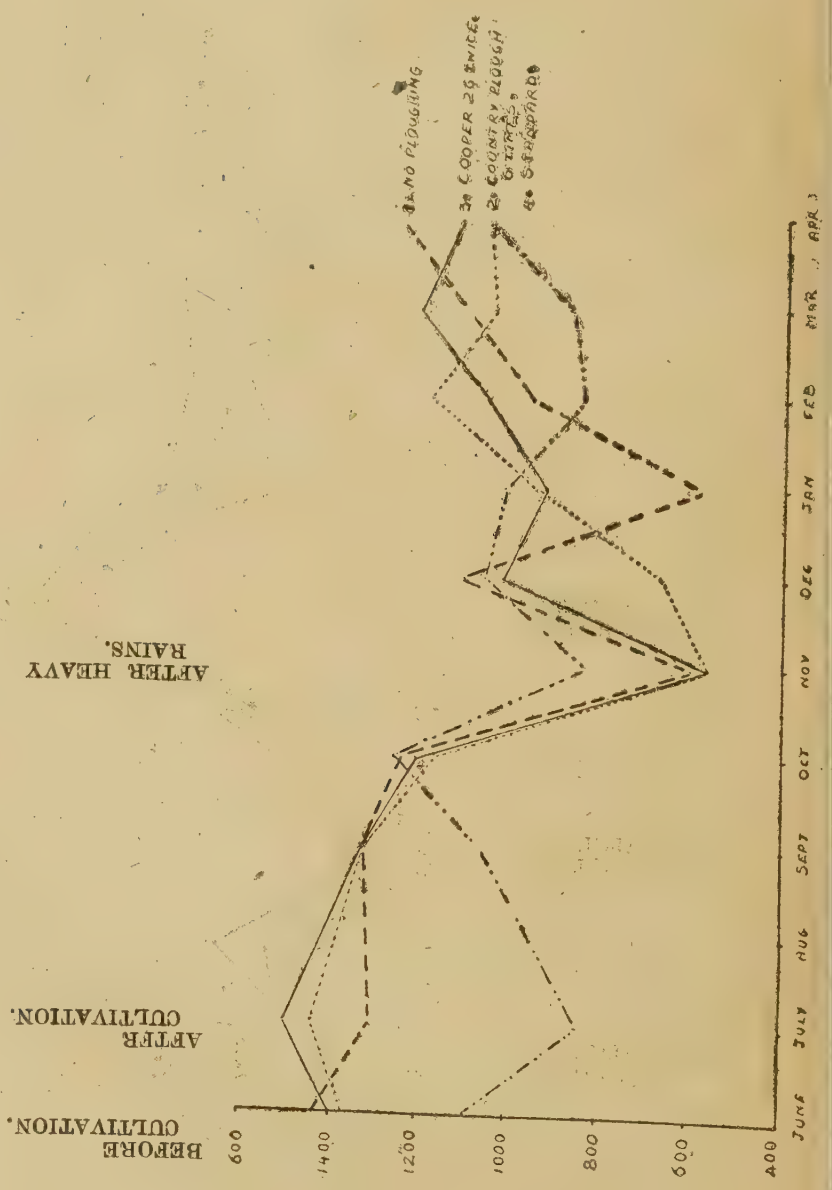
RED SOIL 10-C.



TOTAL SURFACE AREA, 1944-45.

BLACK SOIL 11-B.

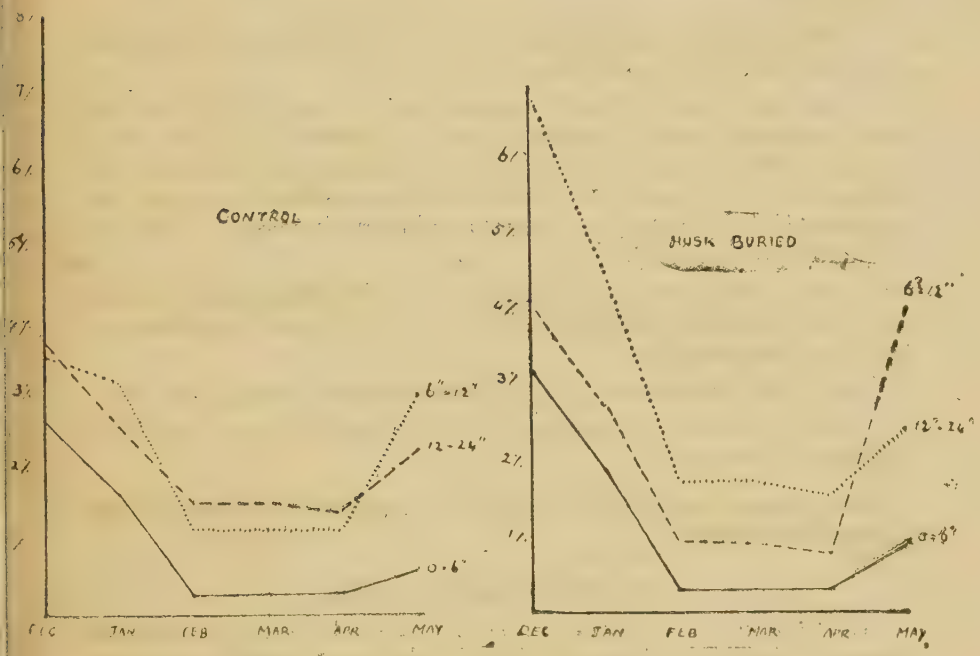
CURVE No. 2.



An examination of the results showed that till the commencement of the hot weather, plots which had the husk buried between the rows showed a higher moisture content than the control plot (Curve No. 3).

MOISTURE PERCENT ON DRY BASIS A.R.S. NILESHWAR.

CURVE NO. 3.



The following table containing the figures for moisture percentage obtained in December 1944 and in March 1945 illustrate the above point :—

TABLE XIII.—*Moisture percentage on dry basis.*

Husk-burying experiment—Agricultural Research Station, Nileshwar :—

	December 1944.		*March* 1945.	
	Control.	*Husk buried.*	*Control.*	*Husk buried.*
0—6″	2·61	3·26	0·26	0·30
6″ — 12″	3·61	4·11	1·13	0·91
12″ — 18″	3·89	6·92	1·50	1·70
0—18″	3·70	4·76	1·09	1·15

5. *Reclamation of alkaline lands under dry conditions.*—An experiment on the reclamation of alkaline lands at Peddapalakalur was started in 1942, but owing to unavoidable reasons it was not pursued. During the years the experiment has been revived and it was decided to devote attention to the following points, in the conduct of the experiment :—

(1) Fencing the experimental area.

(2) Exclusion of outside water from getting into the experimental plots.

(3) Deepening and maintenance of the main and subsidiary drains to improve the drainage of the area.

(4) Application of cattle manure at the rate of 40 tons per acre to represent heavy manuring and at 5,000 lb. per acre to all the other plots except the controls. As the plots will be inaccessible during the rainy season, it was considered desirable to apply the manure (40 tons per acre) in two instalments instead of in four as originally programmed.

(5) A sufficient width of border to be left between the control and the bunded plots in order to eliminate the effect of bunds on the former.

(6) The plots will be cropped with Daincha during 1945—47.

(7) A demonstration maistry will be specially posted to be in charge of this work.

The programme was fixed up in consultation with the District Agricultural Officer.

B. Manures and manuring.

1. *Permanent manurial experiments.*—The old permanent manurials had the 74th crop, fodder cholam (rain-fed) which was sown on 22nd September 1944 and harvested on 12th December 1944. The yields per acre of dry fodder in the plots under different treatments are given in the table below :—

TABLE XIV.

Plot number and treatment.	Acre yield of dry fodder.
	LB.
1 No manure	767
2 N	2,404
3 N + K	2,590
4 N + P	3,000
5 N + K + P	3,698
6 K + P	1,874
7 K	1,956
8 P	1,517
9 Cattle manure	2,475
10 C. M. (Residual)	1,311

Of the artificials, the complete manure plot gave the highest yield followed in order by the N + P, N + K, and N plots showing that nitrogen was the limiting factor in the yield of straw.

In the new permanent manurials plots, the 32nd crop, ragi, was sown on 15th July 1944 and harvested on 6th October 1945. The plotwar yields of grain and straw from the eastern and western series are tabulated below :—

TABLE XV.

Eastern series.				*Western series.*		
Plot number.	*Yield per acre (lb.).*		*Treatment.*	*Yield per acre (lb).*		
	Grain	*Straw.*		*Plot number.*	*Grain.*	*Straw.*
1 ..	1,000	1,750	No manure ..	11 ..	1,175	2,150
2 ..	525	1,300	N	12 ..	1,200	2,575
3 ..	825	2,100	N + K	13 ..	1,375	3,000
4 ..	1,675	3,260	N + P	14 ..	1,700	4,600
5 ..	1,600	3,440	N + K + P ..	15 ..	2,400	3,975
6 ..	1,350	2,460	K + P	16 ..	1,775	3,275
7 ..	800	2,175	K	17 ..	1,325	2,900
8 ..	1,250	2,225	P	18 ..	1,600	3,300
9 ..	900	2,075	Cattle Manure ..	19 ..	2,125	4,525
10 ..	650	1,200	C. M. (Residual) ..	20 ..	1,475	2,475

The western series, with its basal dressing of cattle manure in combination with artificials has on the whole yielded better than the eastern. The phosphate plots in both series have as usual given significantly higher grain yields than the no phosphate plots. Phosphorus has again proved the limiting factor in the yield of grain.

The 33rd crop, cholam A. S. 809, was sown in the new permanent manurials on 27th March 1945 and is awaiting harvest.

2. *The conversion of estate rubbish and nightsoil into compost and field trials on its manurial value.*—It was reported last year that comparative field trials would be taken up on the manurial values of farm-yard manure and compost prepared from estate rubbish and nightsoil. Pits were dug in Field No. 37, Central Farm, and composting of rubbish and nightsoil commenced in May 1944. The work was continued till September 1944, and during the period 12 pits of the dimensions 15′ × 5′ × 3′ were filled up. The bottom layers in the pits required about eight months for satisfactory decomposition, the top layers attaining the proper condition two months earlier. Experimental plots designed to satisfy statistical requirements have been laid out in Field No. 43 (*b*) of the Central Farm. The two manures are being compared at the following levels of dosage, viz., 0, 5, 10 and 15 tons per acre

in randomized plots with split design, each treatment being replicated six times. The experimental plots have been transplanted with ragi and are under observations.

3. *Storage of farm-yard manure.*—The subject of storage of farm-yard manure was somewhat intensively studied during 1919 to 1925 at four important agricultural stations. The systems studied were the loose box, pit with urine trap or byre-pit, pit with sand and the ordinary heap. For the reasons given below among others, the subject is now taken up for re-examination : (i) The earlier field experiments on which the conclusions were based do not satisfy the requirements of present-day statistical canons of experimentation ; (ii) subsequent experience recorded in the Agricultural station reports is not in full accord with the above findings; and (iii) the opinion was held generally by the District Agricultural Officers that the subject is in need of further experimentation.

The object of these experiments is to find on (1) whether manure stored in different ways differ from one another in their manurial value, if so, to what extent, and (ii) whether manures made in different methods show response in crop yields proportionate to their chemical composition.

The voidings collected from four work bullocks of Kangayam Breed of medium age constituted the material used for storage. The animals were housed in a shed paved with stone provided with a pit outside the shed which catches the overflow of the liquid excreta. The manure excreted by the animal every 24-hour period was collected every morning and weighed, divided into three equal parts and one part placed in each of the three systems of storage, viz., roofed pit, open pit and heap. The floor of the stall was immediately cleaned with water and the washings together with urine that had collected in the pit were measured and one third of the total volume was sprinkled on the manure heap under each of the three systems. Three per cent of the weight of straw (on the day's collection of soild manure) was also added daily to facilitate fermentation. The collection was continued till 31st July 1944, when the manure collected in each system was hauled out and weighed and analysed prior to being applied to the experimental plots.

The voidings were analysed just before being placed in storage for their nitrogen content and for their proximate composition, and at the end of the storage period (just after they were hauled and weighed) for moisture and nitrogen content only. The initial analysis was intended to get an idea of the average composition of the material stored while the analysis of the manure at the end of the storage period may be expected to furnish an estimate of the nitrogen content of the final product. The data obtained for the manure stored during the period 1st February to 31st

July 1944 are given in Table XVI and may be taken to represent the composition of manure ordinarily available for storage.

TABLE XVI. *Data on the experiments on the preservation of farm-yard manure.*

Serial number and particulars.	*Dung.*		*Urine.*		*Total.*
	Range.	*Mean.*	*Range.*	*Mean.*	
1 Weight of manure—					
(i) Dung (lb.) ..	..	..	..	..	lb. 18,178·25
(ii) Urine (gallons) ..	..	..	..	..	gals. 221·25
2 Moisture	75·50—81·50	78·91	..	..	..
3 Nitrogen (wet basis) ..	0·37—0·58	0·45	11·68—18·40	14·76	..
Nitrogen (dry basis) ..	1·79—2·54	2·16	..	..	..

Detailed composition of the dung.

Serial number and heads of analysis.	*Range.*	*Mean.*
1 Moisture	75·50—80·70	78·49
2 Ether solubles	..	0·12
3 Water soluble N	0·49— 0·61	0·54
4 Water soluble organic matter	3·72— 6·46	4·79
5 Hemicelluloses	16·48—18·90	17·44
6 Celluloses	17·76—19·17	18·52
7 Lignins	17·96—21·65	20·30
8 Crude proteins	8·06—11·45	9·16

The more important features of its composition are a high C: N value of approximately 28:1 and a high protein content. It may be pointed out that the collection of material for storage was so made as to stimulate conditions of normal stalling in this part of the country, the only deviation being the stone pavement provided. The composition of the manure may therefore be what may ordinarily be expected and is such as would lead to no storage losses. There is not in it such an excess of available or soluble nitrogen as would lead to the loss of valuable nitrogen compound.

The analysis of the manures stored under the three systems at the end of the storage period is given below :—

TABLE XVII.

	Roofed pit.	*Open pit.*	*Heap.*
Total weight of manure (lb)	3,656	3,500	3,684
Moisture (lb)	75·7	57·2	36·7
Oven dry weight of manure (lb.)	990	1,500	2,332
Ash (lb.)	4·1	25·7	55·7
Ash-free weight of manure stored ..	740	600	280

	Roofed pit.	*Open pit.*	*Heap.*
Nitrogen content of oven-dry manure (per cent).	1·95	1·56	0·80
Total nitrogen in the system (lb.) ..	18·3	19·4	18·7

The analytical figures reveal the following interesting features :— (*a*) the better quality of the manure stored under the pit systems, (*b*) the higher ash content of the heap and open pit and (*c*) the remarkably consistent percentage of conservation of the nitrogen placed under storage in spite of widely varying conditions of the three methods. It may be recorded at this stage that the manure stored in the open pit and as a heap were extensively attacked by whiteants. The high ash contents of the two systems is no doubt due to the addition of soil from outside sources by the insects. Computing on the basis of the mean composition of the manures, the total quantity of nitrogen actually stored under the three systems is about 33·6 lb. A uniform loss during storage of 33·6—18·7 or 14·9 lb. of nitrogen, i.e., of about 44 per cent of nitrogen stored is thus indicated in all the systems, which is certainly high. The reason for this cannot be attributed to the whiteant attack not to an unfavourable C : N ratio, but to conditions favourable for denitrification.

The manures stored under the three systems were tested for their crop producing powers in Field No. 49 of the Central Agricultural Station on a crop of late ragi during September-December 1944. The basis for comparison should obviously be the weight of manure as applied to the crop or more properly to the dry weight of the manure corresponding to a 5 or 10 ton application of manure as stored. The manures were tested on both these lines and further as two of the three systems of storage were extensively contaminated by soil introduced by whiteants, a third criterion of comparison was also included, viz., on dry organic matter of the manure. The results of the field experiments with the crop are given in Table XVIII, and that of the residual effect in Table XIX.

TABLE XVIII.—*Yields of ragi crop of farm yard manure storage experiments.*

Field No. 49, Central Agricultural Station. Transplanted on 22nd and 23rd September 1944.
Harvested on 13th and 14th December 1944.

[Yield : in lb. per plot of (16 × 39 lks.) 0·5 cent.

	Roofed Pit.							Open Pit.						
	i	ii	iii	iv	v	vi		i	ii	iii	iv	v	vi	
1 As collected ..	3·6	3·0	4·5	2·5	4·8	2·9	3·6	4·0	4·1	4·4	5·8	4·1	4·3	4·5
	4·3	2·7	4·7	3·2	5·8	1·8	3·8	5·3	3·8	4·4	5·8	4·3	5·0	4·8
2 Ovendry	4·8	3·5	5·6	2·5	4·5	3·0	4·0	4·7	3·5	4·3	3·4	5·0	3·3	4·0
	6·4	5·4	7·0	3·1	6·0	3·0	5·2	6·4	4·8	3·8	5·0	4·8	3·8	4·8
3 Organic matter ..	4·0	4·0	4·2	2·9	4·8	2·6	3·8	4·5	3·5	4·5	5·0	3·6	2·8	4·0
	4·5	4·5	6·5	3·1	6·3	3·2	4·9	6·4	4·3	4·5	6·0	4·0	3·3	4·7

	Heap.							Control.						
	i	ii	iii	iv	v	vi		i	ii	iii	iv	v	vi	
1 As collected	4·8	4·3	3·8	3·3	3·6	2·8	3·8	4·6	4·4	3·8	3·6	3·5	2·6	
	5·8	6·0	3·0	2·9	5·0	3·1	4·3	6·9	4·8	4·5	5·3	4·4	2·7	
2 Ovendry	4·6	3·6	5·0	3·0	4·1	3·6	4·0	6·5	3·3	3·1	3·5	3·7	2·5	
	6·6	4·9	5·0	3·5	4·9	5·0	5·0	5·4	4·1	4·5	4·5	6·0	2·7	
3 Organic matter	5·5	5·2	5·5	3·6	3·5	3·1	4·4	4·5	4·8	3·8	4·0	4·3	2·6	
	6·5	7·8	6·3	4·2	7·5	6·0	6·4	5·4	8·2	5·3	6·0	4·4	2·7	

S. D. (mean) — 0·31 Critical difference

Significant or not — Not significant.

TABLE XIX.—*Yields of cholam crop of farmyard manure storage experiment (residual effect)—crop—summer cholam.*

Field No. 49, Central Agricultural Station. Sown on 15th March 1945. Harvested on 23rd June 1945.

[In lb. per plot (16 × 31 lks.) of 0·5 cent each.]

Roofed Pit.

	i	ii	iii	iv	v	vi	
1 As collected ..	10·3	15·0	9·5	5·5	10·5	10·8	10·2
	24·3	32·4	29·9	20·1	32·6	32·8	
2 Oven-dry	9·3	9·0	14·5	5·5	12·8	13·0	10·7
	27·9	36·5	38·1	27·8	30·9	25·5	
3 Organic matter ..	7·3	13·0	14·5	7·5	12·5	11·8	11·1
	31·8	27·1	30·9	28·3	31·7	30·1	

Heap.

	i	ii	iii	iv	v	vi	
1 As collected	13·3	14·8	12·3	11·3	11·8	12·0	12·6
	32·6	30·5	29·9	28·4	32·6	35·8	
2 Oven-dry	7·8	10·8	14·0	13·0	10·8	14·0	11·7
	30·0	29·4	36·2	33·3	28·4	37·5	
3 Organic matter ..	14·8	7·3	12·3	17·5	9·5	11·3	12·1
	32·5	21·3	33·6	36·1	27·6	27·3	

Open Pit.

	i	ii	iii	iv	v	vi	
	13·8	12·0	9·8	13·5	13·5	11·3	12·3
	25·5	25·9	29·3	31·1	29·2	36·7	
	16·0	12·3	10·8	14·0	9·8	13·5	12·7
	40·9	29·5	26·2	39·1	18·9	36·7	
	14·3	14·0	13·5	11·8	10·8	11·5	12·6
	35·5	29·9	36·0	27·9	33·0	31·9	

Control.

	i	ii	iii	iv	v	vi	
	10·3	14·5	13·5	13·0	6·5	11·3	11·8
	36·0	33·9	27·0	34·3	33·0	33·4	
	12·5	11·5	7·0	11·5	9·0	11·0	10·4
	28·2	33·3	20·0	30·4	28·4	22·7	
	12·5	12·5	3·5	12·3	9·5	14·0	10·6
	28·4	31·5	26·7	35·4	28·9	31·4	

Standard error of mean : — 0·75. Critical difference.

Differences are not significant.

The main effects of the manure under three systems were tested on the crop of late ragi. Owing to unfavourable season the transplanting was done by about the 19th September. It further experienced the adverse effects of early north-east monsoon rains which seriously interfered with cultivation operations. The growth of the crop was poor and the growing period definitely too short. The average yield was so low as 800 lb. and the differences in yield are not statistically significant.

The residual effect was tested on a crop of summer cholam sown in March 1945. The yield data are given in Table XIX and are not statistically significant.

Storage of manure was started again on 7th August 1944 on the same lines for the season 1945–46. Samples were collected as before for analysis although only the final samples of the manures stored could be analysed for its nitrogen content. The analytical data are given below :—

TABLE XX.—*Analysis of and total weights of manure (in lb.) stored during the period August* 1944 *to June* 1945.

Heads of analysis.	*Heap system.*	*Open pit.*	*Covered pit.*
Weight of manure	4,679	6,569	4,987
Dry weight of manure	2,714	3,304	1,750
Organic matter content of manure ..	697	1,071	1,077
Nitrogen	0·75	0·77	1·69

4. *Comparative study of green manure crops.*—As in the previous years, four green manure crops were grown in 'A' block, wet lands, Central Farm, ploughed in situ after recording their green weights, and the plots transplanted with paddy Co.$_2$ The green manures were at the same time examined in the laboratory for their decomposability. The following table gives the yield of paddy in relation to the yield of green matter and decomposability of the four green manure crops :—

TABLE XXI.—*Rank.*

Green manure crop.	Yield of green matter.	Decomposability.	Yield of paddy.
1 Pillipesara	I	I	I
2 Cowpea	II	II	II
3 Sunnhemp	III	III	III
4 Dhaincha	IV	IV	IV

It will be seen from these data that all the four green manures rank in the same way as regards yield of green matter, decomposability and yield of paddy, except cowpea and sunnhemp in point of paddy yield. It may however be stated in general that the yield of green matter and decomposability determine also the yield of paddy. The investigation will be continued.

5. *Green manure decomposition experiments—Field trials at Siruguppa.*—The last batch of samples pertaining to this investigation taken from the irrigated and dry plots (XIV-round experiment

IV of 1943–44) one month after the harvest of the cholam crop, was analysed as usual for carbonate and organic carbon besides total nitrogen and 'Oxidation values', expressed in terms of absolute carbon. The results obtained indicate (*a*) comparatively more accumulation of organic matter and nitrogen (20—25 per cent) in the green manure treated plots (10,000 lb. Cassia auriculata per acre) than at start. The C : N ratios also in all the cases were below 20 and varied within the limits 12·1 and 16·7 depending on the nature of the treatment. The oxidation values also as before agree closely with the corresponding organic carbon figures, indicating the absence of reducing agents other than well-decomposed organic material in the samples. There was no perceptible difference between the fallow and cropped plots in regard to either carbon or nitrogen. The general conclusions from these experiments which have been in progress for the past four years have already been set forth in my annual report for 1943–44. The data collected so far reveal the possibility of enriching the organic matter of black soil under irrigation by a judicious incorporation of bulky organic materials in the form of straw, etc., and concentrated manures like cakes so as to maintain the ratio of "Cellulose + lignin", to proteins at 3 : 2 level. Further experiments under controlled conditions to confirm this finding and eventually arrive at the correct ratios for these factors have been planned and will be taken up shortly.

6. *Organic matter decomposition in black soils—Pot culture experiments.*—To follow the nature and extent of decomposition of organic materials of varying C : N ratio, viz., sunnhemp, paddy straw, groundnut cake and cattle manure—both in presence of super, and super + ammonium sulphate, at intervals of 7, 15, 30 and 60 days a fresh set of experiments in pots was started with black soil from Siruguppa. The object of this study is to see how far super enables the preservation of organic matter added to black soil under irrigation (50 per cent moisture holding capacity, when applied alone and in combination with easily available nitrogenous manures like ammonium sulphate. Three rounds of analysis including the initial one were completed during the year. The results indicate a general and rapid fall in the various fractions of organic matter, but for an appreciable increase in water soluble and amide nitrogen (2 per cent HCl soluble nitrogen) in the groundnut cake treated soil, and to a less extent in the pots receiving green manure. The reduction of nitrogen in the samples is not so abrupt as the total organic matter, and the loss sustained in the several cases is less than 10 per cent of the original nitrogen at start. The production of large amounts of soluble nitrogen at the end of the first week in the cake and green manure treated soils, especially in the presence of super will be of great value in stimulating the growth of crops in their initial stages when protein synthesis takes place vigorously. Further the rate of loss of the various fractions during the second week was fairly appreciable and was more or less

in the same order as during the first week. In regard to the two per cent HCl soluble nitrogen increases were noticed in the green and cattle manure treated plots while with the others a reduction had taken place. It was also found that an all-round and appreciable loss of 80 per cent sulphuric acid soluble and protein nitrogen had occurred in all the treated soils during the two-week period under review. The role of super in preserving the humus and nitrogen contents of the soils treated with different types of organic substances when applied alone or in combination with ammonium sulphate will be discussed when the figures for the entire decomposition period (15, 30 and 60 days) become available.

7. *Utilization of Tiruchirappalli phosphate as fertilizer.*—Pot culture experiments with paddy as crop were carried out with a view to assess the relative fertiliger values of raw and processed Tiruchirappalli phosphate received from the Indian Institute of Science, Bangalore. The soil used was a mixture of the soils from the N + K plot of the old permanent manurials and wet lands, Central Farm in the ratio 9 : 1.

The efficacy of the phosphates (75 lb. per acre) was tested in presence of ammonium sulphate (20 lb. nitrogen per acre) and also with a mixture of green manure and ammonium sulphate supplying the same amount of nitrogen (20 lb.) in the proportion 3 : 2. The control received 20 lb. nitrogen as ammonium sulphate alone. Each treatment was replicated six times. Paddy seedlings were transplanted into the pots 10 days after the application of phosphates and finely ground green manure. The crop came up well, and statistical analysis of yields of grain (Table XXII) reveal a significance for the treatment "Tiruchirappalli phosphate, processed + ammonium sulphate + Green manure." When applied alone, Tiruchirappalli phosphate in any form does not seem to be better than the control receiving ammonium sulphate only. The results further show that Tiruchirappalli phosphate processed and raw, as well as super, behave more or less alike in the presence of a mixture of ammonium sulphate and green manure supplying nitrogen in the ratio of 2 : 3, respectively.

With regard to straw, the control, ammonium sulphate alone, has given the maximum yield.

TABLE XXII.—*Tiruchirappalli phosphate experiments—Processed and raw.*

(*a*) Yield of grain in grams.

	Treatment.							
	A	B	C	D	E	F	G	Remarks and conclusions.
Average of six replications.	2·51	1·43	1·23	4·23	5·31	1·71	4·08	Critical difference C.D. : 2·04.
Percentage increase or decrease over control.	..	— 43·02	— 50·99	68·52	111·5	— 31·87	62·55	E D G A F B C.

(*b*) Yield of straw in grams.

	Treatments.							
	A	B	C	D	E	F	G	Remarks and conclusions.
Average of six replications.	12·61	9·8	9·37	12·1	9·16	9·25	9·93	No significance for treatments.
Percentage increase or decrease over control.		— 22·21	— 25·69	— 4·04	— 27·36	— 26·65	— 21·25	

Details of the treatments—

A. Control. Ammonium sulphate + 20 lb. Nitrogen per acre.
B. Do. + Trichy phosphate, processed, 75 lb. per acre.
C. Do. + do. raw. 75 lb. per acre.
D. Do. + super, 75 lb. per acre.
E. Do. (8 lb.) green manure (12 lb. nitrogen) + T.P. processed, 75 lb. per acre.
F. Do. + do. + T.P. raw, 75 lb. per acre.
G. Do. + do. + super, 75 lb. per acre.

NOTE.—Manures were applied assumming an acre foot of soil to weigh 2,500,000 lb.

The results of field trials with the above fertilizers at the Agricultural Research Station, Aduturai, have not yet been received.

C. Plant Chemistry.

1. *Investigation on the viability of Kolinji seeds.*—The object of this investigation was to find out ways and means to improve the reported poor germination capacity of Kolinji seeds sown as green manure under normal conditions. Details of the treatments proposed to be given for the seeds towards this end are given below :—

(*a*) *Physical.*—(i) Mechanical injury to seed coat by sand polishing and pounding in a wooden mortar, (ii) subjecting the seeds go dry heat at 50°, 60°, 70° and 80°C and also by soaking them in hot water (at 50°C, 60°, 70°, 80° and 100°C) for varying intervals in each case.

(*b*) *Chemical treatments.*—(i) Treatment with strong commercial H_2SO_4 for 5, 10, 15, 30 and 60 minutes, (ii) treatment with 50, 20, 10 and 5 per cent H_2SO_4 for 5, 10, 15, 30 and 60 minutes at 50°, 60°, 70° and 80°C, (iii) treatment with NaOH (50, 20, 10 and 5 per cent) for different periods as in (ii) above and (iv) treatment with lime water [50, 20, 10 and 5 per cent as in (iii) above.]

(*c*) *Treatment with gases and oxidising agents.*—(i) CO_2 for 24 and 48 hours, (ii) oxygen for 24 and 48 hours and (iii) hydrogen peroxide for 24 and 48 hours.

(*d*) Treatment with (i) Hormones (urine from a pregnant cow) and B vitamin—yeast extract, etc.

For the experiments as detailed above, two lots of seeds from Nellore and Tanjore were obtained. From preliminary experiments in the laboratory of Government Lecturing and Systematic Botanist, the Nellore seeds were found to be of very poor viability (8 to 10 per cent) while those from Tanjore though far below normal were comparatively better, with 20 per cent average germination. The Tanjore seeds were therefore used for the trials. The data so far collected are given in Table XXIII.

TABLE XXIII.—*Viability of Kolinji seeds under different treatments.*

Serial number and treatment.	*Percentage of germination—Average of two estimations.*	*Total period for maximum germination : days.*
A. PHYSICAL.		
1 Sand polishing and pounding in a mortar	28·0	3
2 Dry heat at 60°C. .. .. 10 minutes ..	23·5	6
3 Do. .. .. 20 minutes ..	19·5	6
4 Do. .. .. 30 minutes ..	23·5	6
5 Do. .. .. 40 minutes ..	24·0	6
6 Do. .. .. 50 minutes ..	21·0	7
7 Do. .. .. 1 hour ..	27·5	7
8 Dry heat at 80° C. .. .. 10 minutes ..	..	..
9 Do. .. .. 20 minutes ..	28·0	8
10 Do. .. .. 30 minutes ..	19·0	7
11 Do. .. .. 40 minutes ..	Nil	Nil
12 Do. .. .. 50 minutes ..	Nil	Nil
13 Do. .. .. 1 hour ..	Nil	Nil
14 Wet heat at 50° C. .. .. 15 minutes ..	24·0	10
15 Do. .. .. 30 minutes ..	24·5	8
16 Wet heat at 60° C. .. .. 15 minutes ..	23·5	10
17 Do. .. .. 30 minutes ..	19·5	9
18 Wet heat at 70° C. .. .. 15 minutes ..	16·5	10
19 Do. .. .. 30 minutes ..	14·5	7
20 Wet heat at 80° C. .. .. 15 minutes ..	17·0	9
21 Do. .. .. 30 minutes ..	8·5	6
22 Boiling water at 100° C. .. 15 seconds ..	Nil	Nil
23 Do. .. 30 seconds ..	Nil	Nil
24 Do. .. 1 minute ..	Nil	Nil
25 Do. .. 2 minutes ..	Nil	Nil
B. CHEMICAL.		
26 Strong H_2SO_4 .. .. .. 5 minutes ..	38·5	3
27 Do. .. .. .. 10 minutes ..	31·0	6
28 Do. .. .. .. 15 minutes ..	28·0	4
29 Do. .. .. .. 30 minutes ..	17·5	3
30 50 per cent H_2SO_4 .. .. 5 minutes ..	24·0	9
31 Do. .. .. 10 minutes ..	30·0	8
32 Do. .. .. 20 minutes ..	25·0	9
33 Do. .. .. 30 minutes ..	23·0	8
34 20 per cent H_2SO_4 .. .. 10 minutes ..	20·0	8
35 Do. .. .. 20 minutes ..	24·5	9
36 Do. .. .. 30 minutes ..	17·5	9
37 Do. .. .. 1 hour ..	24·0	9
38 10 per cent H_2SO_4 .. .. 10 minutes ..	14·0	6
39 Do. .. .. 20 minutes ..	11·5	5
40 Do. .. .. 30 minutes ..	14·5	5
41 Do. .. .. 1 hour ..	12·5	5
42 5 per cent H_2SO_4 .. .. 10 minutes ..	17·0	6
43 Do. .. .. 20 minutes ..	16·5	5
44 Do. .. .. 30 minutes ..	19·0	6
45 Do. .. .. 1 hour ..	17·0	7
46 50 per cent Sodium Hydroxide .. 10 minutes ..	23·0	8
47 Do. .. 20 minutes ..	18·5	7
48 Do. .. 30 minutes ..	23·0	7
49 Do. .. 1 hour ..	22·5	8
50 20 per cent Sodium Hydroxide .. 10 minutes ..	22·0	8
51 Do. .. 20 minutes ..	21·5	8
52 Do. .. 30 minutes ..	29·5	8
53 Do. .. 1 hour ..	23·5	8

Serial number and treatment.		*Percentage of germination— Average of two estimations.*	*Total. period for maximum germination days.*
	B. CHEMICAL—*cont.*		
54	10 per cent Sodium Hydroxide .. 10 minutes ..	11·0	8
55	Do. .. 20 minutes ..	13·5	10
56	Do. .. 30 minutes ..	12·0	6
57	Do. .. 1 hour ..	19·0	10
58	5 per cent Sodium Hydroxide .. 10 minutes ..	19·5	8
59	Do. .. 20 minutes ..	22·5	9
60	Do. .. 30 minutes ..	19·5	9
61	Do. .. 1 hour ..	15·0	8
62	50 per cent lime water .. 10 minutes ..	21·5	10
63	Do. .. 20 minutes ..	24·5	10
64	Do. .. 30 minutes ..	19·5	9
65	Do. .. 1 hour ..	22·0	9

The figures show that treatment with concentrated H_2SO_4 for 5 minutes has given the maximum percentage of germination (40 per cent) an increase of 100 per cent over control—within 3 days. The next most efficient treatment is with 20 per cent N_aOH for 30 minutes, the percentage germination under this treatment being 29·5 per cent.

The work is in progress, and a full report on the investigation will be presented when the figures for the other proposed treatments become available.

2. *Chemical basis of disease resistances.—A study of the resistance of the paddy plant to Pyricularia.*—Advantage was taken in these studies of the availability with the Government Mycologist of definitely resistant strains of paddy for comparative studies of chemical composition. Two varieties, ADT. 10 and CO. 4, were selected as representative of the resistant and susceptible groups and samples of full-grown plants of each were taken from the same near-by spots of the Paddy Breeding Station, Coimbatore. These were analysed for moisture, nitrogen, phosphoric acid, potash, lime and silica. The results are given below and except in the case of nitrogen, initial moisture, and silica content, no difference in composition are found to exist. Further work is in progress. The results of analysis are given below :

TABLE XXIV.

Name of variety.	*Moisture.*	*Nitrogen.*	*Phosphoric acid (P_2O_5).*	*Potash.*	*CaO.*	*SiO_2.*
	PER CENT.	PER CENT.	PER CENT.	PER CENT.	PER CENT.	PER CENT.
1 ADT. 10—						
Stem ..	8·51	0·71	0·50	0·22	1·48	11·19
Leaves ..	7·27	1·13	0·35	0·69	0·91	16·02
Head ..	7·78	1·26	0·69	0·38	0·45	10·52
Roots ..	8·18	0·64	0·33	0·56	0·423	3·25
2 CO 4—						
Stem ..	7·74	0·42	0·25	0·22	1·57	7·31
Leaves ..	4·82	0·94	0·26	0·62	0·66	12·86
Head ..	9·10	1·19	0·72	0·125	0·479	5·38
Roots ..	8·16	0·42	0·30	0·436	0·869	2·73

3. *The effect of nitrogenous manure and salinity in irrigation water on nitrogen and mineral matter in sugarcane juice.*—From previous experiments indications were obtained that chlorine in irrigation water caused an increase in the nitrogen content of the juice and that available nitrogen in the soil raised in turn the chlorine content of the juice. To get more definite data on the above, pot-culture experiments were started in August 1944. These consisted of the following six treatments with six replications in each : (*a*) rain water irrigation and no top dressing of nitrogenous manure, (*b*) irrigation with the estate tap water containing about 150 parts of total solids per 100,000 and no top dressing of manure, (*c*) irrigation with water containing 500 parts of common salt per 100,000 and no top dressing of manure, (*d*), (*e*) and (*f*) same as (*a*), (*b*) and (*c*), respectively, except for the fact that each was given a top dressing of 100 lb. of nitrogen per acre, half the quantity as ammonium sulphate and half as groundnut cake. The analysis of the canes is in progress, and a separate report will be submitted on completion of the analysis.

4. *The composition of jaggery and its bearing on keeping quality.*—Evidence presented so far by previous workers regarding the influence of salts, reducing sugar, and organic non-sugars on the keeping quality of jaggery has been of a conflicting nature. Experiments conducted with a view to obtain definite data on the above gave the following results :—

(i) Direct experiments in which sucrose solutions were boiled down into jaggery with and without the addition of chlorides and sulphates of sodium potassium and calcium, glucose and fructose showed that all chlorides caused considerable increase in the moisture holding power of jaggeries.

(ii) Fructose showed a similar effect, but glucose to a much less extent only.

(iii) Sulphates of potassium and calcium did not have any deleterious effect ; sulphate of sodium appeared to be harmful.

(iv) Similar experiments with cane juice instead of sucrose solutions yielded the same results.

Further experiments in which a particular ingredient or ingredients were removed from jaggery of known composition by treatment with suitable organic solvents pointed to the same conclusions.

(*a*) Reduction in glucose content alone or in glucose and chlorine contents simultaneously without any change in gums or nitrogen which could be effected by treatment of the jaggery with 95 per cent alcohol repeatedly brings about marked improvement in the keeping quality of jaggery.

(*b*) Clarification with Kieselguhr and activated carbon removes considerable proportion of the gums and a fair portion of the nitrogenous matter from the jaggery but little of the glucose or chlorine ; yet the jaggery so treated exhibits no improvement in keeping quality.

(*c*) On the other hand when the clarified jaggery (obtained by treatment with Kieselguhr and activated carbon) is extracted with 95 per cent alcohol resulting in appreciable reduction of glucose and chlorine contents there is marked improvement in the keeping quality of the extracted product.

(*d*) Finally, when jaggery is extracted with a glycol-methanol mixture, glucose and chlorine are completely eliminated, nitrogenous matter to a fair extent and gums only in small quantities. The treated product is of very high keeping quality.

(*e*) The results were the same whether the material experimented upon was cane, palmyra or coconut jaggery.

The above data appear to furnish convincing evidence to show that the glucose and chlorine contents exercise a profound influence on the keeping quality of jaggery and that the gums and nitrogenous substances play only a minor role in this respect.

5. *Preparation of light coloured jaggery without the use of activated carbon.*—Based on the well-known fact that oxidising enzymes present in the buds, nodes, and tops of canes, reacting with the tannins are partially responsible for the coloration of cane juice, the following method was tried with a fair measure of success :—

The cane is immersed in boiling water for 3 to 5 minutes and then crushed. The juice is clarified with wild 'Vendai' extract prior to liming. Further treatment is the same as for the ordinary process of jaggery making. The product obtained by this process was markedly better than ordinary jaggery and very nearly approached the standard of cream jaggery. The above trials were made only on a laboratory scale with one variety C0·3. Further large-scale trials with other varieties are contemplated.

D. Animal Nutrition.

The activities of this branch continued restricted owing to want of stalling facilities for animals.

1. *The pasture value of giant star grass (Cynodon Plectostachyum).*—This grass is a native of East Africa and promises to grow well under the climatic conditions obtaining in this Presidency. With its vigorous habits of growth it offers possibilities of meeting the enhanced fodder requirements of this country. A sample of air-dry grass was analysed for its feeding value with the following results: —

TABLE XXV.

	PER CENT.
Moisture	6·01
Ash	12·63
Crude proteins	10·16
Ether extractives	1·56
Fibre	29·57
Carbohydrates	40·07
Total	100·00
Phosphoric acid (P_2O_5)	0·50
Lime (C_aO)	0·87

The grass is rich in protein and minerals and would serve as a good fodder. But doubts have been expressed about its suitability as fodder owing to its hydrocyanic acid content. Experiments were therefore conducted to determine its HCN contents at different stages of growth. The data obtained are given below :—

TABLE XXVI.

Stage of growth.	Moisture.	HCN content.
	PER CENT.	PER CENT.
1 Tender	67·67	0·0083
2 Prior to shot blade	89·23	0·0084
3 Full bloom	62·10	0·0069
4 Advanced (after seeding)	61·42	0·0031

It will be seen that the maximum hydrocyanic acid content at any stage of growth is far below the toxic limit of 0·02 per cent.

Feeding trials were conducted with this grass grown under irrigated as well as dry condition, and cut at the different stages of growth. The bullocks experimented with relished the grass and maintained their normal health and body weight. No symptom of toxicity was observed after feeding the grass fresh or wilted cut at any stage of growth.

2. *Digestibility trials of local fodders and feeds and the formulation of detailed rations for the major cattle zones.*—In connexion with this investigation a detailed cattle survey of the Kangayam tract was started and the whole of Erode taluk and a portion of Dharapuram taluk of this district were traversed. Detailed information regarding the care and condition of cattle marked for different purposes was gathered and samples of fodders, concentrates and drinking water were collected. These samples are being analysed.

E. Microbiology.

Studies on the microbiological population of black soils as influenced by irrigation.—The analysis of the third round of post-irrigation samples from Siruguppa Research Station was completed during the year. It was seen that of all the various kinds of analyses to which the soils were subjected 'CO_2 evolution' gave a very fair index of the fertility of the soils and ran parallel with that of crop production. In general it may be stated that the soils had become normal in point of bacterial population both quantitatively and qualitatively.

The fourth round of post-irrigation samples were obtained from Siruguppa and were analysed for total bacterial counts and physiological numbers. All the four samples analysed very low, yielding only a few thousand bacteria per gram of soil, while in the previous analysis the counts were obtained in millions. Since all the samples analysed similarly it was surmized that the soils were

dried in direct sunlight which might have reduced the population so drastically. Hence fresh soil samples were called for, but as all the plots were by then under crop no samples could be drawn until very recently.

F. Agricultural Industries.

1. *Manufacture of agar-agar from sea-weed.*—Work done on this subject during the year consisted in (*a*) devising ways and means to reduce the manufacturing cost as well as operational time of the process and (*b*) determining the suitability of the Coimbatore product for the preparation of bacterial medium comparing it with imported brands of agar-agar.

(*a*) Hitherto 1 per cent HCl was used to remove calcareous deposits from the raw weed prior to cleaning and bleaching it. Experiments were started to find out if it would be possible to reduce the quantity of HCl used without impairing the efficiency and thus reduce the manufacturing cost. The raw weed was soaked in 0·25 per cent, 0·50 per cent and 1 per cent HCl for 15, 30 and 45 minutes each and the yield and quality of agar obtained by each process determined. It was seen that 0·25 per cent HCl required 45 minutes or more to efficiently remove all calcareous deposits, and 0·50 per cent HCl removed the deposit efficiently in 15 to 30 minutes depending on the amount of deposit in the weed. One per cent HCl was found to remove the deposit in 15 minutes but the yield of agar was lower than in the other two cases, probably due to hydrolysis of the hemicellulose. It was therefore concluded that soaking in 0·50 per cent HCl for 15 to 30 minutes was the best in point of efficiency and economy.

The process of bleaching, which consisted in intermitetnt wetting and sundrying the washed weed, is found to take two days even in bright weather. In cloudy weather the period is prolonged and there is danger of the weed decaying. The advisability of dispensing with the bleaching process and thus saving operational time was therefore considered. A comparison of the yield and quality of agar obtained from unbleached weed with those obtained from bleached ones, showed that while the quality of agar obtained by the two processes remained similar, the yield was much lower from unbleached weeds. Evidently the bleaching process not only removes the colour but also 'fixes' the hemicellulose or brings about some other change that results in increased yield of agar. Repeated trials confirmed these observations and proved that it was essential to bleach the weed as a preliminary to the manufacture of agar.

The raw weed after cleaning and bleaching is usually extracted with boiling water thrice, the three extracts mixed, purified and finally dried as agar-agar. Experiments were carried out to determine the quality of agar prepared from the first, second and third extracts separately. Analysis of the products from the three extracts (total nitrogen and ash) showed no difference in quality.

(*b*) The suitability of Coimbatore agar for the preparation of media for bacterial cultures has been tested, and comparative trials have been made with our product and agar-agar obtained from foreign countries, such as Chinagrass (Hopkins and Williams' Straws), Difco' Brand Agar, etc. Media were prepared from these under identical conditions and plating for bacterial numbers done in a variety of samples, viz., three types of soil, milk, water, a pure culture of B. Coli and a pure culture of Staphylococcus. The results are given in Table XXVII below :—

TABLE XXVII.

No.	*Substance.*	*'Difco' 2 per cent.*	*China grass. 5 per cent.*	*Coimbatore. Agar 1 per cent.*	*Coimbatore Agar 1·5 per cent.*	*Coimbatore. Agar 2 per cent.*
1	Soil. Block 8. Siruguppa.	290,000	50,000	290,000	160,000	100,000
2	Soil. Block 3. Siruguppa.	420,000	60,000	520,000	210,000	390,000
3	Soil. Red. Meenampalayam.	610,000	150,000	500,000	390,000	780,000
4	Milk. College Dairy	155,000	86,000	139,000	144,000	134,000
5	Water. M. Block Well.	..	..	..	..	..
6	B. Coli. Pure Culture.	780,000,000	520,000,000	760,000,000	880,000,000	840,000,000
7	Staphylococus Pure Culture.	2,280,000,000	2,450,000,000	2,150,000,000	2,170,000,000	2,220,000,000

The data show that the counts obtained are higher than that from China grass, and equal to or higher than from 'Difco' brand agar. To obtain the same degree of hardness or firm jelly as 1 per cent Coimbatore agar, 2 per cent of 'Difco' and 5 per cent China grass had to be used, indicating that Coimbatore agar is twice and five times cheaper than 'Difco' and China grass, respectively.

Another advantage that Coimbatore agar had over the other two was that it was not as much coloured by the nutrients, thereby rendering it possible to differentiate the normal colours produced by different bacteria. A sample was tested by the Government Mycologist, who pronounced it to be far better in performance than 'Difco' agar.

2. *Malt products from cholam—(a) Preservation of malt food by carbon-dioxide treatment.*—This was a continuation of last year's studies on the subject, the object of the investigation being to test the efficiency of the retention of CO_2 in malt bottles under different conditions of storage, to fix the lethal concentration of CO_2 for the insects and to determine how long this concentration should be maintained for effectively killing them. The results of different experiments showed (i) the possibility of retention of CO_2 up to 30 per cent on the absolute air space of the container with malt food at a less cost by sealing of the bottles with discs of tissue paper and cardboard dipped in hot paraffin, (ii) a concentration of 25 per cent CO_2 is necessary and that should be maintained for at least 48 hours to kill the insects effectively and (iii) such a concentration can be obtained only by loosely packing the food in the bottles.

(*b*) *Correlation between susceptibility to fungus with the specific gravity and reducing sugar content of malt extract.*—This was done in collaboration with the Government Mycologist. The results obtained showed that above a specific gravity of 1·40 and reducing sugar content of 60 per cent, there is little chance of the extract being infested with fungus.

(*c*) *Study of the change of pH of steeping liquids on the production of diastase in cholam malt.*—The results of this study showed that when the pH of the water for steeping cholam in the Malt Factory is adjusted to be between 5 and 6, maximum diastatic power is obtained in the final malt produced.

(*d*) *Uses of starches other than that of cholam for the preparation of malt extract.*—Laboratory trials were conducted with other starches such as those of potato, tapioca, arrowroot, sweet potato and maize with a view to see if the cost of production of malt could be reduced. Extracts were prepared from these by treating them with small quantities of green cholam malt, and it was found that these extracts compare favourably with the factory product, containing 70 to 75 per cent of reducing sugars calculated as maltose. They are found to keep well without getting spoilt or fungus attacked. Of the cereals tried, maize has possibilities since it is a short duration crop and may give a continuous supply of starch.

3. *The manufacture of active carbon from paddy husk.*—In view of the demand for active carbon for purposes other than clarification of cane juice, the production of this material from paddy husk has been going on on a large scale. The work, which was in charge of the Superintendent, Government Malt Factory, was transferred to me on 5th September 1944. The quantity produced for the period ending 30th June 1945 was 14,160 lb. of which about 10,000 lb. were supplied to the Government Malt Factory, and 2,500 lb. to the Government Cinchona Factory at Naduvattam.

The existing furnace having deteriorated in condition due to continuous use, a new furnace has been constructed in front of the farm-yard, but has not started functioning for want of proper facilities.

4. *The production of rubber from Cryptostegia grandiflora.*—Government in their Order No. 3446, Development, dated 8th August 1944, sanctioned a scheme for collection of rubber from *Cryptostegia grandiflora* at 15 centres in the Province. A total of 588 lb. of rubber was collected from all the centres during the period ending 30th June 1945.

(*a*) *Botanical work.*—Studies on the regeneration of drastically pruned rubber vines of unknown age at Bannur have shown that under favourable conditions the vine begins to put forth new shoots in about a fortnight after pruning and produces an abundance of foliage in about two months.

The yields depend to a large extent on the season and number of shoots tapped. The weight of 1,000 plugs collected at Bannur averaged 45 grams during January and gradually went down to 25 grams in May when the plants were in a state of complete defoliation. With the advent of the rains towards the end of May or early in June and consequent appearance of fresh foliage, the plug size improved and towards the end of June an average of 51 grams per 1,000 shoots was obtained. The yield data collected at Coimbatore during April, May and June show an average of 57, 41 and 67 grams, respectively. The higher figure at Coimbatore are due to less of defoliation, slightly thicker shoots, regional effect and possibly to the fact that tapping at Coimbatore was commenced later.

(*b*) *Chemical work.*—Experiments at Coimbatore with plants of known age under irrigated and dry conditions show that the yield and quality of rubber from the irrigated plots is higher than that from the unirrigated. Variation due to seasonal changes is also indicated, but no conclusions can be drawn until at least one year's data are available.

The leaves form an important source of rubber, and in view of this, preliminary experiments on the anaerobic fermentation of the leaf materials were taken up. The results so far obtained show that fermentation helps to soften the material and increase the proportion of rubber in the leaf by its partial decomposition. Treatment with alkali and steam are necessary for the liberation of rubber, and the exact conditions have to be worked out.

A number of mixes have been tried to judge the suitability of *Cryptostegia* plug rubber for the production of a variety of products of common utility. The products were good in quality and the mixes were easy to handle. A slight blowing action was noticed when vulcanized free and this may be due to the moisture and other impurities present in crude rubber. The time of milling operations was short, and due to the high resin content breaking down of the rubber had to be done on cold rollers.

The suitability of *Cryptostegia* as green manure is also being investigated. Analysis of a number of samples of leaf material from different places and a sample of prunings collected at Coimbatore gave results that amply satisfy the pre-requisites of a good non-leguminous green manure. Further work is in progress and proposals for a detailed investigation on the manurial value of the leaf has been submitted separately.

G. Publications.

The following contributions of an original nature were submitted for publication :—

I. Nature and distribution of organic matter in the Tungabhadra project area (Indian Science Congress held at Nagpur held on January 1945).

Part I. Carbon and Nitrogen in Typical Profiles of the Project area.

Part II. Nature of Organic Matter in the Typical Profiles of the Project area.

Part III. A note on the estimation of Organic Carbon in Black Soils of the Project area.

II. Studies on the quality of Potato in the Kotagiri and Ootacamund areas (Indian Journal of Agricultural Science).

III. A Note on Pasture Value of Giant Star Grass (by Government Agricultural Chemist and Government Lecturing and Systematic Botanist).

IV. Influence of the quality of irrigation water (channel water. Vs) effluent and method of preparation of rice flour on its nutritive value (M. A. S. Journal).

V. " Feeding of Dairy Cows " in Tamil (Mezhichelvam).

VI. Review of Experiments done on cultivation at the Agricultural Research Stations in Madras Province.

COIMBATORE,
7th August 1945.

H. SHIVA RAU,
Government Agricultural Chemist.

DETAILED REPORT OF THE GOVERNMENT ENTOMOLOGIST FOR THE YEAR 1944–45.

I.—Charge.

I was in charge of the Entomology section throughout the year except for a month when I was away on leave on average pay, during which period Assistant Entomologist, Sri T. V. Subramaniam, was in full additional charge of the office.

II.—Advisory.

During the year under review 935 enquiries were received; of these 366 were attended to by the headquarters staff and the rest by the Entomological-*cum*-Mycological staff stationed in the districts. Control of crop pests and beekeeping were the major items attended to. The more important pests dealt with are mentioned under the item "Propaganda and Campaign."

III.—Teaching.

The followng lectures and practical classes were held during the year:—

Class.	Lectures.	Practical classes.
B.Sc. Ag. Degree Course—		
First year	65	55
Second year	36	27
Beekeeping—		
First batch	30	30
Second batch	31	31
Short course for sepoys	7	7

IV.—Special Investigations on Crop Pests and their control.

Pests of sugarcane.

Sugarcane borers (*Argyria*, *Diatræa* and *Scirpophaga*)—*Incidence in cane.*—The range of incidence of *Argyria* varied from 13·9 per cent to 16·1 per cent. The results of the observations made so far indicate that a higher temperature and a lower humidity in April-May is congenial for its prolific ovi-position. The incidence of *Diatræa* ranged from 6·6 per cent to 15·5 per cent. The pest makes its appearance during the more humid months in June-July and gets severe with the growth of the crop. It requires more humid conditions than *Argyria* for its proper multiplication. *Scirpophaga* incidence was light; it was found in small numbers throughout the year. Of the three varieties studied, Co. 413, Co. 419 and Co. 421, the second was more susceptible than the first and third.

The average number of tillers formed per mother plant ranges from 4·6 to 6·7 for the three varieties. The average number of dead hearts caused by borers and mortality by other agencies amounts to 2·8 to 5·4 and the average number of canes that comes to harvest is from 1·2 to 1·8 per mother plant for the varieties. The data also show that bulk of the mature canes develop from shoots that emerge up to the end of July.

Alternate host plants.—*Saccharum spontaneum*, *S. arundinaceum* *Arundo donax*, *Pennisetum Hockenackeri* and *Eleusine coracana* (ragi) were examined during the year. The first was found to harbour *Busseola* and *Scirpophaga* and in small numbers of *Diatræa*.

Parasites of borers.—*Trichogramma minutum* and *Telenomius beneficiens* were reared from the eggs of *Argyria* and *Diatræa*. *Apanteles flavipes* was reared from *Argyria* and *Diatræa* caterpillars; *Stenobracon deesæ* from *Argyria* caterpillars *Rhaconotus roslinensis* from *Diatræa* caterpillars and *Rhaconotus scirpophagae* and *Elasmus zehtneri* from *Scirpophaga* caterpillars.

Borer population in stubbles.—Stubbles and tillers left over from the previous crop were examined weekly for five consecutive weeks after harvest and the borer population worked out to an acre basis. It was 1,143, 3,200, 3,692, 2,000, 2,400, respectively, for the five weeks. The population comprised of *Argyria* caterpillars and was found only in the shoots.

Control trials.—These consisted of earthing up of young canes and liberation of the egg parasite *Trichogramma*.

(*a*) *Earthing up of young canes.*—The experiment was conducted in replicated plots with four sets of control and treated ones; the variety being the local Poovan. The planting was done in the first week of September and the earthing up given by the end of the month, when the crop was three weeks old. Regular fortnightly counts on borer incidence were taken from October onwards till the end of February. The results of the experiment are not conclusive since the treated and control plots did not show any striking difference in borer infestation.

(*b*) *Parasite liberation.*—As in the previous year the experiment was conducted at Nellikuppam, the egg parasite.—*Trichogramma*—being multiplied at Coimbatore and sent by post. The releases were at the rate of 8,000 parasites per acre. The effect of the liberation was studied in three-acre plots. The percentage of parasitization and the yields in the released and control fields are given below :—

	Percentage of parasitization.	*Yield in tons per acre.*	*Difference between control and treatment.*
(1)	(2)	(3)	(4)
Control	24·6	21·29	..
Six liberations	40·7	28·85	+ 7·56
Twelve liberations	29·8	24·63	+ 3·34

The cost of treatment was Rs. 12 and Rs. 24 for the six and twelve liberations respectively. Deducting the charges for parasite releases the net gain for the six and twelve liberation plots are Rs. 169 and Rs. 56 at Rs. 24 per ton including the bonus paid by the company.

Pests of paddy.

The paddy mealy bug (*Ripersia oryzæ*).—Control trials, i.e., scorching of the grass growth on nursery bunds before sowing and transplanting the seedlings in fields were continued at the Agricultural Research Station, Aduthurai. Statistically significant results were obtained regarding the incidence of the pest. Trends of increased yield were obtained in bulk plots of samba crop.

The paddy stem borer (*Schœnobius incertellus*).—Studies on the flight range were continued by marking and releasing the moths at different distances from the lights. The moths were found to be attracted to hurricane light from a distance of 150 yards. Due to scarcity of kerosene oil for light traps, trials were made with vegetable oils. It was found that cotton wick light with groundnut oil was able to attract moths and was 80 per cent as efficient as the kerosene light.

Pests of cholam.

The cholam earhead bug (*Calocoris angustatus*).—Different cereals and grasses were examined for alternate host plants. Nymphs of the bug have been collected from a grass—*Dinebra retroflex* Panz.

Trials with D.D.T. and 666 have given very interesting results. Nymphs and adults die as a result of dusting the earheads. The dust is found effective even for fresh nymphs emerging from eggs. In 24 hours there is 95 per cent and more death. Small-scale field trials have shown good setting of earheads when dusted with D.D.T. and 666 at a strength of ·006 per cent. Arrangements have been made to carry out large-scale trials.

Pests of vegetables.

The chillies thrips (*Scirtothrips dorsalis*).—Since tobacco dust which is found as an effective insecticide has gone up in price due to war conditions, trials to find out cheaper insecticides were in progress. It was found that Lobelia decoction and Thevetia emulsion were effective in varying degrees in controlling the pest but these were not as good as tobacco decoction. Two per cent D.D.T. dusted under laboratory conditions has been found to give cent per cent mortality in 24 hours. Field trials will be taken up during the season.

The brinjal bud worm (*Phthorimœa blapsigona*).—The treatments tried against the pest consisted of spraying with tobacco decoction, calcium arsenate plus lime, bordeaux mixture and Thevetia extract and were randomized with suitable controls. The incidence figures

were statistically significant. Thevetia, calcium arsenate plus lime and bordeaux mixture being better, in the order given, than tobacco and control. Fortnightly treatments were not superior to monthly treatments. Yield figures were not significant.

Pests of fruit trees.

The citrus leaf miner (*Phyllocnistis citrella*).—This is a serious pest especially of seedlings and young plants. Insecticidal trials repeated during the year have confirmed the previous results, viz., the superiority of tobacco extract as a toxic agent and of Thevetia extract as a deterrent. Fortnightly spraying was not found superior to monthly spraying. Varietal resistance studies conducted at the college orchard have shown that no variety was immune from attack of the miner and acid lime was the least attacked.

The mango hopper (*Idiocerus* spp.).—Dusting of sulphur and spraying of fish oil rosin soap were repeated during the season against the pest. It was found that dusting of sulphur gives better results than spraying with fish oil rosin soap as judged from the number of fruits on the trees.

The apple woolly aphis (*Eriosoma lanigera*).—The performance of the parasite. *Aphelinus mali* was studied at the Pomological station, Coonoor. The degree of parasitization ranged from 44·5 per cent to cent per cent. It was found that the parasite is not able to keep pace with the pest especially in its swarming stages ; sprayings were therefore undertaken to supplement biological control. Of the insecticides tried Nicotine sulphate, Lobelia and Thevetia gave useful results. The total life cycle of Aphelius was 44 days and the maximum longevity, 37 days. Two other natural enemies, a *Syrphid* and a species of *Chrysopa* were also noted during the year ; the former was found only in the summer months.

Consignments of Aphelinus sent to Kodaikanal and Shembaganoor have successfully established themselves there.

The San Jose scale (*Quadraspidiotus perniciosus*).—The pest is found in the Coonoor and Kotagiri areas on apples, peaches, plums, pears and quince. Fish-oil rosin soap at 1 lb. in 5 gallons of water is giving satisfactory results. As a result of spraying, the number of infested plant in the Pomological station, Coonoor, has been reduced from 121 to 25. There was a similar improvement in the station at Nitens and Asoja estates in the Kotagiri area. The nursery stock from the Pomological station is issued only after fumigation.

Two parasites—Aspidiotiphagus citrinus and *Aphelinus* sp.—have been noted on the scale. The maximum parasitization has been 30 per cent.

Pests of coconut.

The coconut caterpillar (*Nephantis serinopa*).—For the control of this pest at Tudiyalur the Eulophid parasite (*Trichospilus pupivora*) was imported from the West Coast and reared in bulk at the insectary. Parasite liberations commenced in September and were continued until the pest was brought under control by February 1945. In the course of about six months 103,000 parasites were liberated in the area. In about two months of liberation the introduced parasite began to establish itself in the coconut gardens. During March when the area was again examined, the pest had subsided.

Pests of redgram.

Redgram pod borers (*Heliothis*, *Agromyza* and *Bruchus*).—The following treatments were tried in replicated randomized plots with suitable controls :—(1) Dusting tobacco powder and ashes, (2) dusting calcium arsenate and lime, (3) spraying crude oil emulsion and (4) spraying Thevetia emulsion. There was a statistically significant increase in yield in plots dusted with tobacco powder and in those sprayed with crude oil emulsion over the control plots. Incidence in seeds was significantly lower for tobacco dusted and Thevetia sprayed plots.

Pests of wattles.

The fluted scale (*Icerya purchasi*)—*Biological control.*—Mass breeding of the predator—*Rodolia cardinalis*—was done in the stations in the Nilgiris and Kodaikanal. In all 11,600 beetles were liberated during the year ; 7,900 in the Nilgiris and the rest in Kodaikanal with the result that the incidence of the pest is on the decrease where the liberations were done. Special attention was paid to see that the pest did not thrive on citrus.

New host recorded during the year.—As a result of intensive studies new hosts have been recorded. These are—(1) *Walnut*—*Jugulans cordiformis*, (2) *Tephrosia vogelli*, (3) *Pinus longifolia*, (4) *Frenela rhombiodea*, (5) *Leucas suffruticosa*, (6) *Plum*, (7) *Mulberry*, (8) *Pomegranate*, (9) *Casuarina equisetifolia*, (10) *Cassia didymobotrya*, (11) *Achillea millefolium*, (12) *Buxus sempervirens*, (13) *Coreopsis grandiflora*, (14) *Erica mediteranea*, (15) *Plectranthus wightii*, (16) *Pogestemon wightii*, (17) *Melothria perpusilla*, (18) *Senecious lighteanus*, (19) *Oenothera sirensis*, (20) *Helianthus tuberosa*, (21) *Conyza japonica*, (22) *Sphaeranthus indicus*, (23) *Oldenlandia auriculata*, (24) *Anaphalis travancorica*, (25) *Gnaphalium indicum*, (26) *Blumea neilghiriensis*.

Inoculation, under caged conditions, of plants belonging to *Rosaceæ* and *Solanaceæ* are in progress to study whether these can serve as hosts of the scale.

Natural enemies of the scale other than Rodolia cardinalis.—*Rodolia roseipennis*, *Stathmopoda melanochra* *Scymnus* sp. a Reduvid bug and a cecidomyid are the natural enemies other than *Rodolia cardinalis* noted but these are not so effective as *Rodolia cardinalis*.

Studies on Rodolia carainalis.—It has been ascertained (1) that the summer months are the most active periods for the predator, (2) the beetle is more adversely affected in the colder regions of the hills than in the warmer regions, (3) the use of a warm chamber can increase the fecundity of the beetle, (4) rearing of grubs in wooden trays is better than rearing in jars, (5) the lifecycle varied from 36 to 70 days.

Studies on Icerya purchasi.—The egg period of the scale ranged from 29 to 48 days, the first instar from 29 to 34 days, the second instar 26 days and the third instar 42 days. In about a month more it begins to develop an egg sac and swarming continues over a period of one to two months. The scale is having only two generations in the hills. Strong winds are found to act as a good distributing agent of the swarming nymphs. Different hosts give different degrees of protection for the establishing nymphs against beating rains ; gorse bush in particular was noted to afford a high degree of shelter for nymphs.

Plant quarantine work.—Plant quarantine work at Mettupalayam and Shembaganoor was continued. The following are the interceptions made during the year : Eucalyptus, citrus, apple, pear, plum, rose, verbena, Hypericum, Helichrysum, Magnolia and casuarina.

V.—Investigations on Stored Product Pests and their Control.

(*a*) *The potato tuber moth* (*Phthorimœa operculella*).—Studies on the control of the pest were continued at Coonoor and Nanjanad. At Nanjanad tubers dusted with Acorus, Pyrethrum and Derris did not show any attack while those dusted with tobacco and the control showed 4·5 per cent and 11 per cent infestation respectively. At Coonoor, tubers dusted with Derris, Pyrethrum, Acorus, tobacco and control showed 0·7 per cent, 2·8 per cent, 6·3 per cent, 50 per cent and 83 per cent infestation. Arrangements are being made to try lesser strengths of the first three insecticides.

(*b*) *The pulse bruchid* (*Bruchus chinensis B. analis*).—Control trials were continued and monthly counts taken of the incidence for the different treatments, viz., covering the seed with a layer of sand, dried ocimum plants and mixing the seed with red-earth. The counts made in March after a lapse of eight months gave 1·9 per cent, 74·8 per cent, 85·7 per cent and 84 per cent for sand layer, red-earth, ocimum and control, respectively, showing the advantage of the sand layer method. Small scale trials with 2 per cent D.D.T. gave encouraging results.

(*c*) *Pests of cholam malt* (*Tribolium* sp.).—Studies on heat and Co. 2 treatments for preservation of malt food against insects were continued. Exposure to 55°C. for 10 minutes gave complete kill of all the stages of the pest. It was found that Tribolium beetles fed with malt were capable of living up to 447 days.

(*d*) *Pests of stored cholam* (*Calandra*, *Rhizopertha* and *Tribolium*).—Trials on the storage of cholam grains were continued. In mixing of the grains before storage in bags with almicide and magnesite at the rate of 1 lb. per 1,000 lb. of grains, almicide gave satisfactory result when examined at the end of six months, the percentage of loss in almicide being only 4 whereas it was 11·9 and 11·8 in magnesite and controls, respectively.

Mixing D.D.T. and 666 with the grains at ·006 per cent by weight has given very good results in replicated trials in the laboratory as will be seen from the table below :—

TABLE.—*Percentage of mortality* (*average of four replications*).

Treatments commenced 23rd March 1945.	*First examination 23rd March 1945.*			*Second examination 25th March 1945.*			*Third examination 27th March 1945.*			*Fourth examination 29th March 1945.*			*Fifth examination 31st March 1945.*		
	C	*T*	*L*	*C*	*T*	*L*	*C*	*T*	*L*	*C*	*T*	*L*	*C*	*T*	*L*
Control	7	9	8	31	19	18	40	24	22	44	26	29	46	27	45
Talc.	19	4	19	57	16	38	59	19	48	62	21	50	50	24	21
D.D.T and Talc.	58	68	70	98	94	97	100	100	100	..	..	..	..	..	..
666 — talc.	72	29	97	100	64	100	..	80	..	..	95	..	..	100	..

(C = Calandra. T = Tribolium. L = Latheticus.)

The residual effect of the insecticides was also studied. Insects were introduced in the originally treated grains 50 and 90 days after treatment and the percentage of mortality noted. It will be seen from the table given below that even after three months the residual effect of the treatment was evident :—

TABLE.—*Percentage of mortality.*

Treatments.	*After one day.*		*After three days.*		*After five days.*		*After seven days.*		*After nine days.*	
	C	*T*	*C*	*T*	*C*	*T*	*C*	*T*	*C*	*T*
D.D.T fresh	58	68	98	94	100	100	..	..	..	..
D.D.T. 50 days	8	..	66	38	100	100	..	..	..	..
D.D.T. 90 days	17	8	80	50	94	70	100	100	..	..
666 fresh	72	29	100	64	..	80	..	95	..	100
666 50 days	24	4	88	36	100	40	..	100	..	..
666 90 days	32	20	93	25	100	98	..	1,000	..	..

(C = Calandra. T. = Tribolium.)

The treatment did not effect the germination of the grains.

The effect of a layer of treated grains on the top of untreated bulk grains was studied with a view to avoid the mixing of all the grains thereby reducing the cost of the treatment. Very high percentage of mortality of the pests was obtained in the course of four days, 666 proving better than D.D.T.

Dusting of the bags on the outside to save mixing of all the grains thereby reducing the cost of the treatment was found effective especially in reducing infestation from outside where the grains were free at the time of storage. Dusting of bags with grains already infested did not prevent increase of the pest showing that dusting on the outside of bags was effective only with insect-free grains.

The problem of storage of cholam grains in the silo built for the Malt Factory was investigated. The grains put in the silo during July 1944 showed maximum insect infestation by October. In the absence of carbon disulphide fumigation with cyanogas was done, but this did not prove quite effective as the gas did not penetrate deep enough. As germination of the grains was getting affected the whole lot had to be removed by April.

(*e*) *Pests of stored groundnut* (*Necrobia, Tribolium and Ephestia*).—The results of the control trials are given below :—

Sanitary measures.—The terminal storage centres are limited to a few important ports and the whole produce of the country parts is concentrated in the warehouses in these port centres. The presence of these stocks in the warehouses, throughout the year helps the continuance of the pests. The groundnut godowns in Cuddalore have invariably a bedding of sand over which is spread coir matting with the groundnut bags stocked directly on it or with a gunny purdah over the coir matting. This affords ample shelter for the insect pests breeding on the scattered material on the floor of the gardens. General cleaning is difficult in such situations but the coir matting and gunny purdah can be taken out in an air-tight room and fumigated with calcium cyanide ' A ' dust. Trials carried out with this fumigant have given high mortality of the pests. The Government owned godowns at Madras have hard flooring and are found in a better sanitary condition than the sand floored godowns at Cuddalore and Masulipatnam.

Periodical sundrying.—The handling charges for sundrying in the trials conducted at Cuddalore were Rs. 3–8–0 per 100 bags. The operation involves considerable practical difficulties. In addition to this, the frequent handling of groundnut kernels increases the proportion of splits and brokens which is not desirable.

Fumigation of empty godowns.—Cyanogas and chlorosal were tried as fumigants at 3 lb. and 7 lb., respectively, per 1,000 cubic feet space. It was found that the insect fauna on the surface of the sand flooring was killed but those which were 3 to 4 inches inside were not affected in both cases. Apart from this consideration the existing groundnut godowns at Cuddalore and Madras are not so constructed as to be made air tight for fumigation purposes. So this measure cannot be recommended for general adoption.

Keeping a permanent layer of sand on the floor of the godown.—This is the general practice in all the godowns at Cuddalore. Examination of the different godowns during the year has shown that the sand retains the kernels scattered during handling operations and a permanent source of infestation within the godowns. Keeping a permanent layer of sand should therefore be discouraged. If a layer of sand is to be kept it is desirable that it is periodically removed and fresh sand brought in to prevent breeding of the pests.

Superheating of godowns.—Trials were conducted at Coimbatore to test the efficacy of this method. A room of 1,500 cubic feet capacity and four charcoal furnaces each holding an average of 14 pounds charcoal were used for the experiment. The maximum temperature recorded was 138°F. Necorbia and Tribolium used as test insects were not markedly affected. This method was not effective and it also involves considerable risk of fire and also practical difficulties in the operation.

Reduction of interval between decortication and storage.—Examinations made during the year showed that there was very little of insect damage to groundnut when stored in the form of pods. Ryots generally keep their seed material in the form of pods for about eight months but the surplus stock is disposed of in the markets as kernels soon after harvest. If there is reduction of the interval between decortication and storage, the insect trouble can be minimized greatly but the problems of transport and limitations of space in the godowns are arguments against pod storage.

Trials with D.D.T. (a new item).—Preliminary trials with the above insecticide have given hopeful results. Groundnut kernels were mixed with different doses of D.D.T. and kept for *natural infection* and examined after eleven weeks. It was found that 2 per cent and 5 per cent D.D.T. lots had no live insects and no loss in weight while the control had a number of live insects and 20·7 per cent loss. When mixed with kernels and *insects introduced* 4 per cent and 10 per cent D.D.T. gave cent per cent death of Necrobia in three days. Small bags filled with kernels were dusted on the outside with different doses of D.D.T. and known number of insects introduced outside the bags. This treatment also gave encouraging results there was cent per cent kill of Necrobia in three days for 2 per cent D.D.T.

VI.—Studies on Insecticides.

Considerable progress was made in the study of insecticides especially D.D.T. and 666—

(1) *D.D.T. and* 666.—The results of the trials of these insecticides against pests of stored cholam, stored pulses, stored groundnut kernels, chillies thrips and the cholam earhead bug have already

been given under these respective pests. The results of the further trials alone are given below :—

(*a*) *Cane borers* (*Argyria*).—Of the different strengths tried viz., 5 per cent, 2 per cent, 0·1 per cent and ·006 per cent only the first two had lethal effect on caterpillars. They had however no effect on egg masses. Field trials are in progress.

(*b*) *The lab-lab bug* (*Coptosoma cribraria*).—This is a pest difficult to control with ordinary insecticides ; a 10 per cent D.D.T. dust however gave good results against the insect. Trials with smaller doses are in progress.

(*c*) *White-ants* (*Microtermes* sp.).—Bamboo treated with D.D.T. dust and D.D.T. in kerosene gave good results against termites. The treated bits were buried in the soil and examined periodically. At the end of three months the controls were completely eaten up while the treated were not affected.

(*d*) *Black-ant* (*Camponotus compressus*).— Five per cent D.D.T. dust was very effective against these ants while 2 per cent was only partially effective.

(*e*) *Lepisma* sp.—Dusting of 1 per cent D.D.T. gave cent per cent kill in 24 hours.

(*f*) *Bed bugs, flies, mosquitoes, roaches and head-lice.*—The good effect of a 5 per cent D.D.T. reported by previous workers against the above mentioned pests has been confirmed.

(*g*) *Cane borer egg parasite* (*Trichogramma minutum*).—The parasites were exposed to 2 per cent D.D.T. and 666 for a minute. In the latter case all the parasites died while in the former a few (1 per cent) recovered. Both the chemicals were found to have repellent properties since egg cards of Corcyra, dusted with these, were not parasitized.

(*h*) *Honey bees.*—A 0·5 per cent D.D.T. and 666 in honey acted as a stomach poison when fed to the bees ; of the two, the first gave higher percentage of mortality. When dusted inside the hive, 666 was a more effective contact posion than D.D.T., the former killed the entire bee population in the course of 10 hours while the latter killed only 10 per cent.

(2) *Other insecticides tried—Pyrethrum.*—Four species of pyrethrum received from the Cotton Specialist were tried against aphids and tingicids to note their comparative effect. Kerosene extract of pyrethrum at a strength of 1 in 10 of water plus soap was effective against Phenococcus and Pulvinaria scales on redgram.

Thevetia.—Thevetia oil emulsion at a strength of 1 ounce in one gallon of water gave cent per cent, 76 per cent and 35 per cent kill against small, medium and grown up caterpillars of *Achoea janata.*

Lobelia.—Lobelia decoction with addition of soap gave good results against the brinjal—Tingitid, snake gourd aphis and Bhendai mites. Against the castor mite it was as good as dusting flowers of sulphur.

VII.—Life History Studies and Pest Control at Headquarters.

The more important of the insects whose life history and habits were studied are given below :—

(1) The carabid predator—*Parena laticincta* of the coconut caterpillar—*Nephantis serinopa*.
(2) *Glitina scitaria* and *Pericyma glancinans* on *daincha*.
(3) Egg parasites of the paddy stem-borer.
(4) An Tahneumonid parasite of Melanitis ismene.
(5) *Opius fletcheri*—parasite of fruit flies.
(6) *Pteromalid* parasite of *Epilachna*.
(7) *Elasmus* sp. on *Chapra mathias*.
(8) *Scymnus* sp. on *Pseudococcus virgatus* on custard apple.
(9) A predatory moth—*Eublemma amabilis* on lac on fig.
(10) Parasites and predators of the cotton aphis.

Control of pests in and around the Central Farm were carried on as usual. The chief insects that were dealt with during the year were *Epilachna* beetles on bitter gourds and brinjals ; jassids on cowpea, bhendi, cluster bean and black and green grams ; hairy caterpillar on ber, fig and moringa ; aphis on ragi, lab-lab, horse bean, oranges, cabbage, bhindi, chillies and cotton ; scales and mealy bugs in ragi, croton, rose, coconut, neem and derries ; Plusia on gourds ; Parasa on mango ; fruit flies on gourds ; beetles on pumpkin ; leaf roller on cotton ; Nephantis on coconuts ; thrips on paddy, ragi and chillies ; mites on castor ; Coptosoma on lab-lab as well as field rats.

VIII.—Bee keeping.

1. *Apiary.*—The apiary attached to the institute had on an average 40 *colonies*. From July to September the weather was windy ; the pasturage during the time was acacia, plantain, drumstick and a few vegetable flowers. From October to December cholam, cumbu, maize and a few weeds yielded pollen in abundance. From January to February there was good collection of nectar and pollen from cotton and garden flowers. Comb construction was very brisk and maximum of honey was 52 lb. got in February. The record for individual hive was 14 lb. 8 oz. The period—March to June was hot and droughty ; there was not much of nectar secretion from margosa, *Albezzia*, *Peltophorum* and other avenue trees and the condition of the colonies was not quite satisfactory. A total of 126 lb. of honey was extracted from 25 colonies.

2. *Research.*—Research on various aspects of bee keeping was continued and showed progress.

Bee enemies.—Studies on the yellow banded wasp—*Vespa cincta*—were continued. A nest killed by the application of the fumigant—calcium cyanide—showed 356 individuals in all out of which 335 were males.

Swarm preventions.—The utility of the swarm prevention trap was tested during the year. It was found that this contrivance was as good as dequeening and 'demaree' methods and more useful in the case of out-apiaries where it is not possible always to watch the issue of swarms.

Bee pasturage.—Three plants noted for the first time as bee pasturage are given below :—

Cleome viscosa—Pollen—May.

Oryza sativa—Pollen—November.

Bauhinia hookeri—Pollen—June.

Longevity studies.—The maximum longevity for a worker was found to be 60 days. For noting the effective longevity of workers these were marked and examined at different intervals. One set of trials was started on 8th November 1944 and the other on 6th January 1945. Over 40 per cent of the workers were found alive till 40th day after which mortality was rapid. During the course of the above observations it was found that some workers, three days old, also participated in a swarm.

Flight range of bees.—In June 20,000 workers was marked for these trials. The maximum distance travelled by bees for forage was 6 furlongs.

Improvement of colonies by selection.—Out of the four colonies selected, one lost its queen ; the three remaining colonies are being studied for the honey yield and other desirable traits.

3. *Propaganda.*—There were 10,173 hives working in this Presidency during the year under review. As a result of the intensive propaganda done by the Entomological section and the district staff, be-keeping is gaining popularity. The annual honey week organized by the Entomological section was celebrated in June 1945 at Coimbatore ; it was inaugurated by Rao Bahadur C. Satyanarayana Chowdary, B.A., B.L., District Judge. There was a bee exhibition in connexion with the celebrations. Training in bee-keeping was imparted to 43 students of the Government Training School, Coimbatore, and also to several batches of sepoys sent by the military. The bee-keeping assistant visited different rural recreation centres and gave talks on the subject. Exhibits were sent to the different exhibitions. Foundation combs were supplied to the public. Practical hints on bee-keeping were published every month in the departmental journal in Tamil and Telugu.

IX.—Fumigation.

Fumigation work was very heavy during the year. Fifteen thousand mica cases of the Bombay Company, Limited, were fumigated at Madras with Cymag against the Bostrychid borer—*Heterobostrychus* sp. One thousand eight hundred and sixteen bags of cholam were fumigated for the Sperintendent, Malt Factory,

Coimbatore. One hundred and seventy-five bags of wheat and 583 bags of barley in the Government godowns at Coimbatore were fumigated. In addition to these, the following were fumigated and pest-free certificates issued :—

(1) Samples of groundnut and gingelly seeds for the Oil Seeds Specialist for despatch to Ceylon.

(2) Seventy-eight pounds of paddy seeds for the Paddy Specialist.

(3) Five lots of cardamom seeds and three small bags of cardamom pods for the Government Mycologist.

(4) Five hundred pounds of cholam and 1,380 lb. of ragi seeds for the Millets Specialist.

(5) One hundred and thirty-one bags of paddy intended for despatch to Burma.

(6) One hundred and twenty-one packages, as an anti-plague measure, for the different heads of section.

Plant quarantine work at the ports of Negapatam, Madras, Tuticorin and Dhanushkodi continued to be under my charge.

X.—Systematic Studies and Collections.

As in the previous year due to the pressure of economic work, much time could not be devoted for systematic studies. Studies on parasitic Hymenoptera were, however, continued. Insects collected during the year were preserved for sending abroad for identification after the war. One consignment of insects was received back identified by the Imperial Entomologist and another by the Imperial Institute of Entomology, London. Appointment of an Assistant Entomologist for systematic studies and to be in charge of our valuable collections will be welcome.

XI.—Propaganda and Campaign.

The chief items of work of the Entomology cum Mycology staff in the districts are demonstration of remedial measures against pests of crops and stored produce and popularization of bee-keeping as a cottage industry. Pest Act operations were also in their charge. The important pests noted in the districts during the year are given below :—

North and South Vizagapatam.—The Entomology Assistant stationed at Anakapalle attended to pest control work in these districts. The more important pests dealt with were the paddy gall fly, the red hairy caterpillar, cut worms on potatoes, Epilachna and Tingitids on brinjal, mites on bhendi and stored grain pests.

East and West Godavari.—In addition to bee-keeping work remedies for the following pests were demonstrated by the Entomology Assistant at Samalkot : the paddy mealy bug and the swarming caterpillar ; the coconut beetle and slug (*Natada*) ; the

mango hopper ; citrus leaf caterpillar and leaf miner ; chillies thrips ; brinjal Epilachna ; lab-lab Aphis and Aulacophora on gourds.

Nellore.—The major pests tackled by the Entomological Assistant stationed at Nellore were the stem borer, mealy bug, hispa and swarming caterpillar of paddy, Epilachna and shoot borer on brinjal, semilooper and pod borer of castor and the citrus borer. Some time was spent in popularizing bee-keeping.

Cuddapah and Anantapur.—The coconut beetle, the mango borer, the onion thrips, Prodenia on tobacco, Aphis and fruit flies on melon, Epilachna on brinjal, the citrus caterpillar, the castor semilooper, Calandra and Rhizopertha on stored wheat and the cattle fly (*Stomoxys*) were the pests dealt with by the Entomological Assistant, Cuddapah.

Chingleput and Chittoor.—The Entomology Demonstrator at Saidapet, in addition to the work on bee-keeping, was engaged in the demonstration of control measures against the red hairy caterpillar on groundnut, the coconut caterpillar, the palm beetle, Cirphis and Spodoptera on paddy and Epilachna on brinjal.

North Arcot, South Arcot and Salem.—The following pests were dealt with by the Mycology Demonstrator at Vellore : the mango hopper, the coconut caterpillar, the coconut beetle, Aphis on citrus, grape vine flea beetle, Plutella on cabbage ; Athalia on turnips and stored product pests.

Trichinopoly and Tanjore.—The more important pests dealt with in these districts by the Assistant Agricultural Demonstrator in Mycology were the stem borer, thrips, mealy bugs and Cirphis on paddy, the mango hopper and pests of stored grains.

Madura, Ramnad and Tinnevelly.—The red hairy caterpillar, the grape vine flea beetle, the leaf miner, Aphis and Papilio caterpillar on citrus, the mango hopper, the snake gourd fruit fly, brinjal Epilachna, chillies thips, bhendi shoot and fruit borer and the coffee white borer were the more important pests tackled by the Mycology Demonstrator stationed at Madura.

Malabar and South Kanara.—In addition to bee-keeping work, the Mycology Demonstrator at Calicut bred and liberated parasites for the control of the coconut caterpillar. He also demonstrated remedies against the mango hopper, the cashew hairy caterpillar, the paddy swarming caterpillar, chillies thrips, tobacco Aphis and Epilachna on brinjal.

Coimbatore and Nilgiris —Control work in these two districts was in charge of the headquarters staff. The coconut caterpillar, the coconut beetle, the paddy swarming caterpillar, the cholam ear-head bug, the castor semilooper, brinjal fruit borer, the potato tuber moth, mites on bhendi, cutworms and Plutella on cabbage, Aphis on lab-lab, Parasa and hopper on mango, Aphis and mealy bugs

on guava, fruit flies on pumpkins and scales (*Aspidiotus*) on rose were the important pests tackled by the staff. Considerable propaganda work was done on bee-keeping.

XII.—Scientific Papers Prepared.

The following papers were prepared during the year :—

(1) Insect pests of vegetables and their control.

(2) 'Bee-keeping as a cottage industry' and 'Hints for bee-keepers' for different months.

(3) Pests of citrus and their control.

(4) Thevetia neriifolia—a potent insecticide.

(5) Sweet flag—a source of vegetable insecticide.

(6) Insect pests of stored grains and their control.

(7) The stem borer and mealy bug of paddy and their control.

XIII.—Preservation of Foodgrains (Civil Supplies).

The Assistant Entomologists at Bezwada, Madras, Coimbatore and Trichinopoly appointed for the preservation of foodgrains worked under my technical guidance. A meeting of the Assistant Entomologists was held at Madras for the purpose of evolving a uniform method of procedure to be adopted by them. Fumigation of infested grains, advice for the proper storage and priority of disposal of grains were the main items of work of the staff. As a result of the work of the staff considerable quantities of food grains—especially wheat—were saved from destruction.

Coimbatore,
6th August 1945.

M. C. CHERIAN,
Government Entomologist.

DETAILED ADMINISTRATION REPORT OF THE GOVERNMENT MYCOLOGIST FOR THE YEAR 1944–45 (FASLI 1354).

Charge.—I held charge of the office throughout the year.

2. The activities of the section are classified and reported on under the following heads :—

I. Research on diseases of food-crops.
II. Research on diseases of industrial crops.
III. War efforts and Agro-industries.
IV. Cardamom research.
V. Survey of Pollu and wilt diseases of pepper.
VI. Quarantine services and legislative measures.
VII. Propaganda.
VIII. Teaching.
IX. Advisory work.
X. Microtomy.
XI. Grow More Food.
XII. Miscellaneous.

I.—Research on Diseases of Food-crops.

3. *Rice—Blast disease* (*Piricularia oryzae*)—*Resistance—Field trials.*—The experiments were continued during the year under report. As in the previous year they were laid out in two series. In the first series 128 cultures comprising of 64 long duration cultures which had exhibited high resistance during the Previous season, departmental strains from other provinces, important representative types from the chief rice tracts of this province, and three wild varieties were all sown and transplanted at the same time irrespective of their duration. In the second series 116 cultures were grouped according to their duration into three categories, viz., ' long ', ' medium ' and ' short ' and the sowing and transplantation so adjusted that the flowering period of all the cultures more or less synchronized. The cultures in both the series of experiments were planted inter-stripped with rows of Adt. 10—a highly susceptible variety. An outskirt of two feet all round the experimental area was also planted with Adt. 10 in order to provide for maximum incidence of disease. Observations on the extent and intensity of infection were recorded periodically. The relative incidence of the disease on cultures which exhibited a certain amount of resistance having an incidence of only 10 per cent or less is given below :—

TABLE I.—*Cultures of rice exhibiting relatively high resistance with less than* 10 *per cent of incidence of neck attack.*

	Serial number and name of variety.	*Duration in days.*	*Yield in ounces.*	*Percentage of incidence.*
1	3839	179	17·8	7·2
2	3185	185	10·0	7·3
3	2744	189	12·7	7·6
4	2366	190	9·1	8·1
5	2552	190	12·3	8·2
6	2380	186	12·7	8·3
7	2554	190	12·5	8·3
8	2364	190	13·8	8·4
9	3273	190	11·2	8·9
10	3635	190	12·7	10·0
11	Adt. 10 (Control)	165	11·0	73·8

Standard error—8·84. Critical difference—13·5. Results—Significant.

TABLE II.—*Long duration rice cultures showing less than* 10 *per cent of incidence of neck infection from Piricularia oryzae.*

	Serial number and name of variety.	*Duration in days.*	*Yield in ounces.*	*Percentage of infection.*
1	2744	189	10·9	1·9
2	3185	185	14·2	2·5
3	2555	190	12·5	2·5
4	2380	186	13·5	2·5
5	2552	180	14·7	2·9
6	8036	183	14·4	3·1
7	2554	190	12·4	3·2
8	3273	190	14·9	3·4
9	3840	179	14·8	3·5
10	3839	179	15·8	4·5
11	2486	186	16·2	5·0
12	3381	183	16·2	8·1
13	3635	190	12·9	6·3
14	2501	186	15·1	6·3
15	2202	189	12·8	6·3
16	2364	190	13·5	6·5
17	2559	189	17·0	6·6
18	2366	190	15·0	7·0
19	3374	185	12·4	7·4
20	3342	189	12·8	7·5
21	4072	167	14·9	7·7
22	8037	180	13·0	7·7
23	8343	189	13·7	7·7
24	2488	187	15·6	7·8
25	Co. 4	180	12·5	8·0
26	Adt. 17	165	14·0	8·0
27	3883	172	11·8	8·3
28	8348	183	13·9	8·6
29	2465	185	16·4	9·0
30	8349	186	14·3	9·3
31	Adt. 6	220	12·5	9·3
32	2566	187	13·8	9·3
33	2713	181	14·4	9·3
34	8212	169	11·8	9·4
35	4005	176	15·6	9·6
36	Adt. 10 (Control)	165	6·2	48·2

Standard error—15·39. Critical difference—8·2. Results—Significant.

TABLE III.—*Medium duration rice cultures showing less than 10 per cent incidence of neck infection from Piricularia oryzae.*

	Serial number and name of varieties.	Duration in days.	Yield in ounces.	Percentage of infection
1	Mtu. 15	125	6·2	7·2
2	Ptb. 16	155	8·5	7·6
3	Adt. 13	160	10·6	9·9
4	Adt. 10 (Control)	165	8·3	36·5

Standard error—8·81. Critical difference—13·74. Results—Significant.

Among the short duration cultures the percentage of incidence ranged from 12·0 per cent (Adt. 4) to 32·9 per cent (Ptb. 9) while the control had 29·8 per cent of neck infection. Thus all of the cultures under trial can be considered be more or less susceptible.

Reduction in yield caused by neck infection in different cultures.—It is well known that the loss caused by blast varies with the intensity of infection and time of infection. But advantage was taken of the incidence of the diseases on the different cultures to evaluate the amount of loss due to the same degree of infection in different cultures. One hundred tillers having neck infection were collected from the following cultures and the yield from these was compared with the yield from an equal number of healthy tillers. The relative yields are recorded below :—

TABLE IV.—*Loss in yield due to neck infection in different varieties.*

Variety.	Weight or grain in ounce from 100 tillers.		Loss in weight.	Percentage of loss.
	Healthy.	Infected.		
Adt. 10	8·25	4·25	4·00	48·05
Co. 15	6·50	5·00	1·05	23·01
Co. 4	7·00	6·50	0·05	7.01

It is seen from the above that in Co. 4 the reduction in yield is very light.

Influence of graded doses of nitrogenous manures on the incidence of blast disease.—Field and pot experiments were conducted to investigate the influence of nitrogenous manures on the incidence of the disease. Two cultures—Adt. 10, highly susceptible and Co. 4, highly resistant—were utilized. Ammonium sulphate or groundnut cake was used as the source of nitrogen. The former was applied at the rate of 1, 2 or 3 cwt. per acre and the latter at 3, 6 or 9 cwt. per acre besides a basal dressing of 5,000 lb. of green leaf per acre. In the field experiment, ammonium sulphate and groundnut cake were applied one month after transplanting. The incidence of the disease on Adt. 10 increased with the increase in the dosage of the nitrogenous manure. But in Co. 4 the infection was low in all the treatments. Analysed statistically the results were not significant.

TABLE V.—*Manurial experiments*—1944–45—*Percentage of neck infection.*

Treatments.	Adt. 10.	Co. 4.
Ammonium sulphate 1 cwt. per acre ..	47·04	8·03
Do. 2 cwt. ,, ..	58·08	4·09
Do. 3 cwt. ,, ..	60·09	3·08

Treatments.	Adt. 10.	Co. 4.
Groundnut cake 3 cwt. per acre	47·03	5·07
Do. 6 cwt. ,,	54·01	4·04
Do. 9 cwt. ,,	61·00	6·04
Control	53·09	6·01

Not significant.

4. *Foot-rot of rice—Fusarium moniliforme var-majus—Varietal resistance—Field experiments.*—Fifty-seven cultures of rice made up of 32 extra-provincial cultures and twenty-five departmental strains of Madras Province were under trial to assess their relative susceptibility to this disease. The seed was surface-sterilized and later steeped in spore suspension to obtain uniformity of spore load. Periodical counts of mortality of seedlings were made for evaluating resistance. Cultures which exhibited a mortality of less than 10 per cent are listed below. Co. 10 was utilized as control. The results are statistically significant.

TABLE VI.—*Cultures of rice showing less than* 10 *per cent mortality.*

Foreign varieties.		*Short-duration varieties.*	
Serial number and name of variety.	*Percentage of infection.*	*Serial number and name of variety.*	*Percentage of infection.*
1 N. 22 (United Provinces).	0·4	1 Mtu. 2	0·5
2 T. 136 (United Provinces).	2·9	2 Adt. 16	1·0
3 Luchai (Central Provinces).	2·2	3 Mtu. 10	1·1
4 Ar. 108-1 (Assam)	2·0	4 Geb. 24	1·7
5 Bore II (Assam)	2·1	5 Mtu. 8	1·4
6 Aman II (Assam)	3·9	6 Adt. 7	1·6
7 S. 22 (Assam)	7·5	7 Mtu. 5	2·5
8 A.S. 2 (Assam)	0·9	8 Ptb. 2	2·9
9 No. 7, Musukan (Punjab)	4·8	9 Ptb. 10	3·6
10 No. 246, Palman Suffaid (Punjab).	4·3	10 Mtu. 13	4·3
		11 Bam. 7	4·9
11 No. 349, Jhona (Punjab)	3·8	12 Adt. 20	5·6
12 Silver Jubilee (Sind)	8·8	13 Adt. 15	6·5
13 Kangin 27 (Sind)	5·9	14 Adt. 14	7·1
14 K. 42 (Bombay)	5·2	15 Ptb. 9	7·3
15 Z. 31 (Bombay)	1·0	16 Mtu. 1	8·0
16 Jhingasail (Bengal)	1·8	17 Bam. 3	8·8
17 Co. 10 (Control)	22·8	18 Adt. 4	8·9
		19 Co. 10 (Control)	29·2
Standard error—3·0.		Standard error—2·1.	
Critical difference—5·5.		Critical difference—5·9.	
Results—Significant.		Results—Significant.	

Seed treatment—Fungicidal trials.—The efficacy of seed dressing with six fungicides, viz., Agrosan G, copper carbonate, fine sulphur, Baluchistan sulphur, Formalin-charcoal dust and Harvesan for the control of foot-rot was tested. The seeds of a susceptible variety (Co. 10) were artificially infected and later dressed with the above fungicides. After the treatment the seeds were soaked in water for 24 hours and sown after sprouting. Counts of mortality

of the seedlings were taken. It was found that Agrosan G gave the best control. The relative incidence of infection in the different treatments was as follows :—

TABLE VII.—*Foot rot—Fungicidal trials.*

Treatment.	Percentage of infection.
1 Agrosan G	0·56
2 Formalin-charcoal dust	3·54
3 Fine sulphur	2·23
4 Copper carbonate	2·86
5 Baluchistan sulphur	1·96
6 Harvesan	1·25
7 Control	7·03

Standard error– 0·57. Critical difference—2·15. Result—Significant.

Feeding trials on poultry with ceresan treated seed.—It was presumed that seeds dressed with organo-mercury compounds are not to be fed to livestock lest fatal results occur. In order to verify this, an experiment was conducted in which two chicken were continuously fed for three weeks with grains treated with ceresan. There was no adverse effect on the chicken even when the dosage of ceresan used was four times the normal rate of 1 gram per pound of seed.

Effect of seed dressing with ceresan on germination.—Rice grains were treated with ceresan at the rate of 1, 2, 3 and 4 grams per pound of seed and sown along with a control to find out if the fungicide exerts any influence on the germination of the seeds. The results showed that there was no deleterious effect on the germination when 1 gram or 2 grams are used per pound of seed. But when 3 or 4 grams of ceresan per pound of seed are used the germination is delayed though there was no reduction in the percentage of germination.

5. *Helminthosporiose of rice—Effect of seed treatment on incidence of disease.*—A field experiment was conducted to evaluate the efficacy of seed treatment with five different fungicides, viz., Agrosan G, copper carbonate, fine sulphur, Baluchistan sulphur, and Formalin-charcoal dust on the control of this disease. The incidence of the disease during the year was negligible in all the treatments including the control. The data relating to the infection and yield of rice in all the plots were analysed and found to be not significant. These experiments were carried out as a part of a co-ordinated scheme of trials initiated by the Imperial Council of Agricultural Research.

6. *Ephelis oryzae on rice—Seed dressing and spraying trials for the control of the disease.*—The effect of seed-dressing and spraying the plants prior to ear-head formation on the incidence of the disease was tested. The seeds were obtained from an area where the disease was prevalent during the previous season. Agrosan G

and sulphur were the fungicides used for seed treatment. One month after transplanting half the number of rows in each treatment was sprayed with 1 per cent Bordeaux mixture. There was no significant difference in the incidence of the disease in the different treatments.

7. *Sorghum—Control of sorghum smut—Experiment* I.—The investigations on the comparison of alternative methods of control of this disease which were commenced in the previous year were continued on an expanded scale. The relative effects of seed dressing with sulphur compared to the sun drying or shade drying of sorghum seeds after soaking in water on the control of the smut was tested. The experiments were conducted at Coimbatore Koilpatti (Tinnevelly district) and Ongole (Guntur district). Similar trials were carried out at the Agricultural Research Station, Nandyal, and Agricultural Research Station, Guntur, by the farm staff in collaboration with this section. In all the areas sulphur has given the best control, both the pure sulphur and the Baluchistan sulphur being equally effective. The two methods of sun-drying and shade-drying of soaked seeds reduce the incidence of smut but are not as effective as sulphur. The results obtained this year were found to be statistically significant. Sulphur seed dressing is more effective and economical than the other two methods which involve extra time and labour also.

TABLE VIII.—*Summary of results of cholam smut seed dressing experiments*, 1944–45.

Particulars of treatment.	*Venue.*					
	Coimbatore.		*Koilpatti.*	*Ongole.*	*Guntur.*	*Nandyal.*
	Peelamedu.	*Central Farm.*				
Sown on ..	31*st August* 1944.	16*th September* 1944.	20*th October* 1944.	8*th November* 1944.	14*th November* 1944.	26*th September* 1944.
Observed ..	12*th December* 1944.	21*st January* 1945.	24*th and 25th January* 1945.	7*th February* 1945.	23*rd February* 1945.	24*th January* 1945.
A. Sulphur ..	6	0	0	0·06	0·27	0
B. Sun-dried.	2·33	4·6	0·85	3·19	1·30	0·58
C. Shade-dried.	1·40	4·8	1·24	3·06	1·88	0·93
D. Control ..	5·33	7·5	2·19	5·38	18·08	3·18
E. Baluchistan sulphur.	..	..	..	..	..	0
Standard error.	0·347	1·37	0·3099	0·261	1·62	0·134
Critical difference.	1·048	4·129	0·0933	0·786	3·36	0·390
Z test P ..	0·05	0·05	0·05	0·05	0·05	0·05
Significant or not.	Significant.	Significant.	Significant.	Significant.	Significant.	Significant.

NOTE.—Baluchistan sulphur was included at Nandyal alone.

Experiment II.—Comparison of different fungicides for the control of smut.—The relative merits of five different fungicides in controlling smut was tested in collaboration with the Imperial Council of Agricultural Research. Field experiments were conducted at Coimbatore and Ongole. The seeds were either mixed with a definite quantity of spores before treatment or naturally infected seed was used. The incidence of smut was recorded just before harvest. Copper carbonate, pure sulphur, Baluchistan sulphur and Agrosan G controlled the disease effectively and were equal to one another in their efficacy. Formalin-charcoal dust was not effective. The results are given below :—

TABLE IX.—*Statement showing the relative merits of different treatments—Infection expressed in percentage.*

Treatment.	Coimbatore.		Ongole—Naturally infected.
	Artificially infected.	Naturally infected.	
Agrosan G. ..	2·73	1·29	1·43
Copper carbonate ..	0·29	0·23	0·59
Formalin-charcoal dust ..	21·62	2·78	3·74
Pure sulphur	1·69	0·09	0·04
Baluchistan sulphur ..	0·94	0·47	0·04
Control	24·66	2·63	4·09

The yield of grains from the plots receiving different treatments was also recorded in the experiment conducted at Coimbatore. The seed setting was very poor owing to the unusually heavy rains at the flowering stage and large-scale incidence of the sugary disease of sorghum caused by *Sphacelia sorghi*. Consequently the yields of grain from the different treatments did not exhibit any significant difference.

8. *Tenai—Setaria italica—Rust* (*Uromyces setariæ-italicæ*).—An unusually heavy outbreak of rust on this crop caused by *Uromyces Setariæ italicæ* was recorded from Kurnool district. Consequently attention was focussed on the isolation of strains of this crop resistant to this disease in collaboration with the Millets Specialist. The collection of the cultures at the Millets Breeding Station was examined and the relative incidence of rust on these recorded, following the method adopted in estimating wheat rust. All the cultures grown at the Millets Breeding Station were susceptible with an incidence of 27 to 100 per cent. More cultures are under study by the Millets Specialist.

9. *Ragi—Elusine coracana—Blast—Piricularia sp.—Varietal resistance trials.*—Twenty-one cultures of ragi were tested during the year. Sowings were conducted in June, July and August and the seedlings were transplanted in July, August and September, respectively. The disease was in evidence in all the cultures but in

varying degrees. The crop sown in August was heavily infected by blast in the nursery. The same crop after transplantation developed the highest incidence of neck infection in the later stages. The range of infection among the cultures varied from 33·9 per cent in E.C. 155 to 75·6 per cent in E.C. 1540. It has been confirmed once again that this disease is influenced by the season to a condiderable degree. Under conditions prevailing in Coimbatore the crops transplanted in July is least affected and the incidence of disease increases in crops transplanted later.

10. *Wheat rusts.*—The scheme for the control of wheat rusts was in operation during this year also. The suspension of the cultivation of wheat and barley crops on the Nilgiris, Pulneys (Mathurai district) and Devikulam (Travancore) during the months of April to September was enforced in 1944 also. During the months of December 1944 to February 1945 a survey was made of the cold weather crops of wheat on the Nilgiris and other notified areas to estimate the incidence of rusts.

Suspension of the cultivation of the first crop.—The provisions of the Madras Agricultural Pests and Diseases Act were employed to enforce the suspension of the cultivation of wheat and barley between April and September 1944 in the notified areas. The District Agricultural Officers of Nilgiris and Mathurai were in charge of the enforcement in their respective jurisdictions with the help of a special staff. During the year the Travancore Government also collaborated by prohibiting the cultivation of wheat in Devikulam in that state. The prohibition was successfully enforced. Stray cases of sowings were immediately dealt with by the removal of the crop.

Estimation of rust incidence in the cold weather crop.—A survey of the wheat crop was conducted on the Nilgiris, Pulneys and Devikulam on the hills, and Coimbatore, Ceded districts and the Mysore province in the plains. The following observations were made·—

On the hills all the three rusts, black, brown and yellow, were prevalent. The brown and yellow rusts were prevalent much earlier than black rust.

In the plains, black rust and brown rust were alone recorded. Black rust was noticed much earlier in the plains than on the hills. But brown rust was recorded earlier on the hills. Yellow rust was not recorded in the plains.

TABLE X.—*Time of record of wheat rust in the year.*

Locality.	*Black rust.*	*Brown rust.*	*Yellow rust.*
Hills—			
Nilgiris—			
Ootacamund taluk.	March 1945 ..	January 1945 ..	....
Coonoor taluk ..	Do. ..	Do. ..	January 1945
Pulneys—			
Kodaikanal taluk.	....	November 1944.	....
Devikulam (Travancore).	....	....	....

Locality.	*Black rust.*	*Brown rust.*	*Yellow rust.*
Plains—			
Coimbatore ..	September 1944.	September 1944.	....
Bellary	February 1945 ..	....	....
Cuddapah	Do. ..	....	....
Anantapur ..	Do. ..	....	....
Guntur	January 1945 ..	January 1945 ..	....
Mysore Province ..	October 1944 ..	February 1945 ..	....

The scheme has been discontinued from April 1945. Though originally sanctioned for a period of three years from April 1943, it was abruptly closed at the end of two years.

11. *Potato—Investigations into the cause of low yield and poor quality of Kotagiri potatoes.*—Based on an assumption that these defects of the Kotagiri potatoes might be due to certain deficiencies of essential nutrient substances in the soil, a preliminary field experiment was conducted on a private farm at Kotagiri during the second crop season of 1944. Arbitrary quantities of potash, superphosphate, magnesium sulphate and boric acid were added to the soil along with and in addition to a basal dose of Shaw Wallace Company's potato manure mixture. Besides these treatments, the foliage was sprayed with dilute solutions of boric acid, manganese sulphate or magnesium sulphate. The seasonal conditions were disappointing with the result that the yield of potatoes was very low in all the plots. There was, however, an indication that the addition of magnesium sulphate to the soil may prove beneficial in increasing yields. The same experiment has been repeated in another farm at Kotagiri during the main crop season of 1945. The crop is still growing and not yet ready for harvest.

Survey of the potato crop on the Nilgiris to estimate the incidence of virus diseases.—The continuous fall in the yield of potatoes and reduction in the proportion of ware in the yield have led to the impression that these cannot be entirely attributed to the lack of high grade fertilizers alone. The role of virus diseases in causing the reduction was suspected. These diseases have been recorded on the Nilgiris but there are no data regarding their distribution on the hills. In order to obtain further details of the incidence of these diseases, surveys of the potato crop were made during March in the irrigated crop and in June in the main crop. The results of the survey have shown that virus diseases are prevalent all over the hills and to a much greater extent than was originally suspected. The types of virus diseases occurring in the Nilgiris are Aucuba mosaic, mild mosaic, negligible mosaic, crinkle and leaf roll. The following table gives the degree of infestation in different parts of the Nilgiris.

TABLE XI.—*Incidence of potato virus diseases on the Nilgiris.*

Locality.	*Range of incidence.*
	PER CENT.
Nanjanad	5 to 59
Ootacamund	11 to 71
Keti	10 to 25
Kotagiri	12 to 29
Coonoor	10 to 26

The incidence of the virus diseases was higher in the main crop than in the irrigated crop.

Reduction in yield due to virus diseases.—The reduction in yield of tubers caused by the virus diseases was estimated by actually determining the yield of potatoes from equal numbers of diseased and apparently healthy plants marked at random in the field. At the time of harvest the weights of tubers from each plant were recorded. The results are shown below :—

TABLE XII.—*Comparative yield from virus infected and apparently healthy potato plants.*

	Keti.		*Kotagiri.*	
	Diseased.	*Apparently healthy.*	*Diseased.*	*Apparenty. healthy.*
Number of plants	49	49	48	49
Total number of tubers ..	379	764	354	498
Total weight of tubers ..	22 lb. 4 oz.	54 lb. 8 oz.	13 lb.	25 lb. 10 oz.
Average number of tubers per plant.	7·7	15·6	8	10·2
Average weight of tuber per plant.	7·3 oz.	17·8 oz.	4·3 oz.	8·3 oz.

The above results show that there is a marked reduction in the number and weight of tubers produced by virus-infected potato plants which must contribute towards the lowering of the level of yield in general on the Nilgiris taking into consideration the fact that virus diseases are widespread on the hills.

12. *Citrus—Mottle leaf—Deficiency disease.*—The experiments on the control of this disease were continued at Panyam, Kodur and Yercaud. The results so far obtained have shown that zinc sulphate lime mixture spray is the best method of combating the disease in the plains. But the recovery of the plants is not permanent and the symptoms recur after a lapse of time. Further investigations are under way to determine the frequency of sprays to bring about the complete recovery of the plants and to maintain the trees in a state of health. The following treatments have been carried out during the year and the results are being recorded :—

(1) *Spray treatments*, with zinc sulphate-lime mixture.
  (1) 3 sprayings a year.
  (2) 2 sprayings a year.
  (3) 1 spraying a year.
  (4) Control, no spraying.

(2) *Soil treatments* in addition to two sprayings.
  (1) Application of groundnut cake at 10 lb. per tree.
  (2) Application of green leaf at 50 lb. per tree.
  (3) Control, 2 sprays alone.

At Yercaud, zinc sulphate has not produced any satisfactory control of the leaf mottle. It appears that zinc deficiency may not be the sole casual factor in this area. Experiments have been

conducted utilizing magnesium sulphate, manganese sulphate and zinc sulphate as sprays. Application of lime to the soil has also been tried. Periodical observations are being recorded on the condition of the treated plants. Being a perennial crop the response to these treatments is likely to be slow.

II.—Research on Diseases of Industrial Crops.

13. *Cotton—Black arm—Phytomonas malvacearum—Seed treatment.*—Field trials were continued to assess the value of seed treatment with fungicides for the control of this seed-borne disease. It was confirmed that the treatment has no effect on the prevention of secondary infection and is not beneficial under local conditions.

Varietal resistance.—The varietal plots at the Cotton Breeding Station were thoroughly examined to note the relative incidence of the disease on the selections grown in the station. A number of plants exhibiting the least amount of infection under field conditions have been marked out in collaboration with the Cotton Specialist to study their future performance. Artificial inoculations of some of the wild types of cottons were made to determine their reaction to the disease.

14. *Tobacco—(a) Broom rape—Orobanche cernua* var *desertorum.*—The experiments to find out practicable and economic methods of controlling broom rapes on tobacco were continued at the Agricultural Research Station, Guntur, under a special scheme of research sanctioned by the Government.

Experiment 1.—It has been reported from Russia that the addition of dried and powdered sunflower material to the soil exercises a stimulating influence on the germination of the seeds of orobanche which perish later for want of suitable host plants. Thus the incidence of broom rapes could be reduced. In 1943–44 an experiment was laid down to see if the application of organic matter obtained from sunflower or *pillipesara* to the soil reduces the incidence of orobanche on tobacco. There was no significant difference between the treatments. Tobacco was planted in the same field this year to test the residual effect of this treatment. Counts of the broom rapes were recorded.

Table XIII.—*Residual effect of organic matter applied to the soil on the incidence of orobanche and yield of green leaves.*

	Sunflower in situ.	*Sunflower from outside.*	*Pillipesara.*	*Control.*	*Mean.*	*Significance.*
Mean number of orobanche shoots per plot.	70·17	67·83	99·17	67·00	76·43	Not significant.
Mean yield of green leaves in oz. per plot.	294·3	273·5	284·2	224·1	269·0	Do.

Similar observations were made in the pot experiments where organic matter had been applied during the previous season. The results of the pot and field experiments indicate that organic matter of either sunflower or *pillipesara* incorporated into the soil does not reduce the incidence of orobanche even one year after application.

Experiment 2.—The residual effect of the incorporation of organic matter obtained either from fresh or dry Solanaceous plants on the incidence of orobanche was investigated by growing tobacco in pots containing soil with which the above substances had been mixed in the previous season. Plants of brinjal, tomato, datura, tobacco among the Solanaceae and sunflower belonging to Compositae were the sources of organic matter. None of the treatments was superior to control. The yield of green tobacco was, however, significantly higher in pots to which sunflower and datura dry material had been added.

Experiment 3.—*Chemical versus mechanical methods of control.*—The experiment to find out the relative efficacy of the application of chemicals for the destruction of broom rapes compared to eradication by handpicking was continued during the year. The incidence of broom rapes in the experimental plots was recorded. It was found that there was no significant difference in the incidence of broom rapes of yield of green leaves between the plots.

TABLE XIV.—*Effect of mechanical and chemical methods of removal of orobanche.*

	Copper sulphate solution saturated.	*Ferrous sulphate solution saturated.*	*Copper sulphate plus ferrous sulphate.*	*Atlacide 1 lb. in 1 gallon of water.*	*Atlacide 2 lb. in 1 gallon of water.*	*Agri-tree killer solution 1 : 6.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mean number of broom rapes removed per plot.	38·25	52·25	30·50	31·50	30·5	34·25
Mean yield of green leaves per plot in oz.	127·0	123·63	137·75	142·75	112·75	142·63

	Agri-tree killer solution 1 : 8.	*Handpicking.*				*Control.*	*Signifi-cance.*
		Every-day.	*Alter-nate days.*	*Once in 3 days.*	*Once a week.*		
	(8)	(9)	(10)	(11)	(12)	(13)	(14
Mean number of broom rapes removed per plot.	32·25	45·50	58·75	41·25	41·75	28·5	Not signi-ficant.
Mean yield of green leaves per plot in oz.	134·88	134·38	120·0	139·88	135·5	126·75	Do.

The following table gives the percentage of rapes actually killed consequent on the application of the chemicals mentioned below on the broom rape shoots :—

TABLE XV.—*Mortality of orobanche shoots caused by the application of various chemicals.*

Treatment.	Total number of rapes treated.	Total number of rapes killed.	Percentage of mortality.
1 $CuSo_4$ solution saturated once a week.	96	64	66·7
2 Ferrous sulphate solution (saturated) once a week.	144	80	56
3 Mixture of $CuSo_4$ and $Fe_2(So_4)$ solution saturated.	89	54	61
4 Atlacide 1 lb. in 1 gallon.	84	64	76
5 Atlacide 2 lb. in 1 gallon.	25	15	60
6 Agri tree killer 1 : 8 dilution.	68	66	97
7 Agri tree killer 1 : 6 dilution.	84	84	100
8 Control..	98	Nil.	Nil.

Agri tree killer solution of the strengths used kills the shoots of orobanche in 48 hours without causing any injury to the tobacco plant. The rest of the treatments affect only young shoots bringing about their death in the course of ten days. The older shoots are either not affected or only partially affected and without interference to seed setting.

Experiment 4.—*Effect of the previous crop on the incidence of orobanche.*—This is the second year of the experiment wherein the following cropping system is being adopted

System of cropping.

First year.	Second year.	Third year.	Fourth year..
1 Tobacco.	Tobacco.	Tobacco.	Tobacco.
2 Pyru jonna.	Do.	Pyru jonna.	Do.
3 Tobacco.	Chillies.	Coriander.	Do.
4 Tobacco.	Tobacco.	Variga.	Do.
5 Groundnut.	Do.	Maize.	Do.
6 Chillies.	Do.	Sajja.	Do.

The experiment is being conducted in two places, at the Agricultural Research Station, Guntur, and in a neighbouring ryot's field. There was no significant difference either in the incidence of broom rapes or in the yield of tobacco between treatments in both the places.

Experiment 5.—*Varietal resistance trials.*—The twenty-one varieties which were under trial last year were again included as the incidence of orobanche in the previous season was negligible. During this season a heavy incidence of the parasite was observed.

There was significant difference between the varieties regarding incidence of orobanche and also in yield of green leaves as shown below :—

TABLE XVI.—*Tobacco—Varietal resistance trials—Summary of results.*

Serial number and treatments.	*Rape incidence.* Mean number of rapes removed.	General mean.	Standard error.	Critical difference.	Significance.
(1)	(2)	(3)	(4)	(5)	(6)
1 Adcock	54·80				
2 Amarels	48·60				
3 Bonanza	26·80				
4 Chathi vilathi	48·40				
5 Conqueror	20·60				
6 Country rat tail	39·20				
7 Dumbara	29·40				
8 Dequesene	23·00				
9 Gold dollar	32·00				
10 Halby special	17·40				
11 Havana	29·40	33·00	5·03	10·06 at 5 per cent level 13·38 at 1·8 per cent.	Highly significant.
12 I.P.H. 1	15·00				
13 I.P.H. 7	12·60				
14 I.P.H. 142	39·20				
15 Karravithanam	14·20				
16 Manilla	17·40				
17 Turkish	40·60				
18 Virginia bright	49·00				
19 White mammoth	41·40				
20 Yellow mammoth	35·60				
21 Control (Harrison Special).	50·40				

Serial number and treatments.	*Leaf yield.* Mean yield of green leaves in ounces.	General mean.	Standard error.	Critical difference.	Significance.
	(7)	(8)	(9)	(10)	(11)
1 Adcock	27·90				
2 Amarels	40·90				
3 Bonanza	32·40				
4 Chathi vilathi	32·30				
5 Conqueror	27·50				
6 Country rate tail	49·60				
7 Dumbara	38·70				
8 Dequesene	23·20				
9 Gold dollar	38·90				
10 Halby special	30·60				
11 Havana	51·50	35·05	3·03	6·06 (5 per cent).	Highly significant.
12 I.P.H. 1	34·80				
13 I.P.H. 7	40·40				
14 I.P.H. 142	42·60				
15 Karravithanam	51·10				
16 Manilla	47·60				
17 Turkish	14·50				
18 Virginia bright	22·20				
19 White mammoth	26·80				
20 Yellow mammoth	25·00				
21 Control (Harrison Special).	37·60				

Conclusion—

Rape incidence—1, 21, 18, 2, 4, 19, 17, 6, 14, 20, 9, 5 7, 11, 3, 8, 10, 16, 12, 15, 13

Leaf yield—11, 15, 6, 16, 14, 2, 13, 9, 7, 21, 12, 3, 4, 10, 1 5, 19, 20, 8, 18, 17

The varieties 10, 12, 13, 15 and 16 were the most resistant as judged by the lowest incidence of orobanche shoots. The varieties 1, 2, 4, 17, 18 and 19 were on a par with the control. The others occupied an intermediate position.

The yield of green leaves was significantly superior in varieties, 6, 11, 15 and 16 ; the yields from varieties 2, 3, 4, 7, 9, 12, 13 and 14 were on a par with the control and in the others the yield was less than control. Varieties, havana, karravithanam, country rate tail and manilla were superior to control in respect of broom rape incidence and yield of leaves.

Fundamental studies—(*a*) *Longevity of orobanche seeds.*—Germination studies have revealed that the seeds are viable even after two and a half years.

(*b*) *Role of domestic animals in disseminating the parasite.*—The observations were continued with the experimental pots of the previous season wherein the voids of buffaloes, cattle and goats fed on orobanche shoots and collected on successive days after feeding had been added. It was noticed that orobanche shoots emerged in larger numbers in pots to which voids collected one and two days after feeding had been added.

(*c*) *Germination studies of orobanche seeds.*—Following the method of inducing germination evolved in the previous year, further experiments were conducted to note the effect of higher temperatures on the viability of the seeds. It was found that seeds exposed for 4 hours at 40°C and then at 90°C dry heat for one hour retained their viability. Exposures to higher temperatures for varying periods are under trial.

(*d*) *Host range of orobanche.*—Besides the hosts already recorded in the preceding year, it has been found that orobanche can parasitise *Nicotiana sandarae* and *Withania somnifera* belonging to Solanaceae. *Euphorbia prostrata* belonging to Euphorbiaceae was found to be parasitised by orobanche in pot culture experiments.

(*e*) *Trap crop experiments with Datura fastuosa* var *alba.*—The marked stimulation of germination of orobanche seeds by *Datura fastuosa* was observed in the previous season. The utility of this plant as a trap crop to reduce the incidence of the parasite in the succeeding tobacco crop was tested. The following experiments were conducted :—

Experiment 1.—Lay out. Randomized blocks—replicated six times.

Treatments.—(1) Growing datura as a trap crop in July, pulling out after three months and then transplanting tobacco in the area.

(2) Growing datura as a trap crop in July and ploughing in after three months and then transplanting tobacco.

(3) Control—without any trap crop.

Since the germination of datura seeds was poor, 8 plots in 4 replications were transplanted with datura seedlings 30 days old at the rate of 1,000 seedlings per cent. The experiment was conducted at the Agricultural Research Station, Guntur and in a neighbouring ryot's field. Broom rapes appeared in all the plots. In the ryot's field the two treatments with datura were on a par and produced significantly less broom rapes than the control, but in the matter of yield of green leaves there was no difference between the treatments. However, at the Agricultural Research Station, Guntur, there is no significant difference between the treatments either in the incidence of orobanche or yield of leaves.

Experiment 2.—Lay out. Randomized blocks—12 replications.

Treatments.—(1) Growing datura in the punasa or early crop season, and transplanting tobacco in the late or pyru season.

(2) Control—Without trap crop.

This experiment was conducted at the Agricultural Research Station, Guntur, in the black and the red soil areas. In the former there was no difference between the plots in the incidence of the parasite but higher yields of green leaves were obtained from the control plots. There was, however, no difference between the treatments in the red soil area either in the incidence of the parasite or yield of green leaves.

Experiment 3.—In this experiment the tobacco was inter-cropped with datura. The treatments consisted of (*a*) drilling datura seeds between the rows of tobacco at the time of planting, (*b*) planting datura seedlings between the rows of tobacco at the time of planting, (*c*) control—without datura between the rows of tobacco. The incidence of the parasite was observed on datura and tobacco. But the growth of tobacco was poor in the inter-cropped plots. The analyses of the results showed that the control and planting datura seedlings in between the rows of tobacco were on a par and produced significantly less number of rapes than the other treatment (drilling seeds of datura between rows of tobacco). The yield of green leaves was significantly higher in the control plots.

(*f*) *Sowing of datura seeds.*—The germination of datura seeds was neither uniform nor high. In order to determine the optimum period for sowing datura seeds to obtain the maximum percentage of germination 11 fortnightly sowings were made commencing from the last week of June. The maximum percentage of germination, viz., 9·2 per cent occurred in the sowings conducted in the middle of August. The optimum conditions necessary for good germination are the occurrence of sufficient rains before and after sowing. The incidence of orobanche on these datura plants was low.

Method of sowing.—To find out the best method of sowing datura seeds in order to obtain maximum germination the following

experiment was conducted with three treatments replicated six times. The results are recorded below.

TABLE XVII.—*Germination of datura seeds.*

Treatments.	Total number of germination.	Percentage of germination.
1 Drilling with a *gorru* and covering with a *guntaka*.	658	1·10
2 Dibbling seed behind a country plough.	380	0·62
3 Broadcasting seed and covering with junior hoe.	770	1·29

The results of these experiments show that under field conditions, the germination of datura is too low to be of practical use. But as in the case of other cultivated Solanaceous plants like brinjal, chillies, tomato, etc., a higher percentage of germination is obtained when seeds are sown in nursery beds. It was determined that for every 77 plants obtained under nursery conditions only one plant is produced in the field.

Effect of pre-soaking seed on germination.—The datura seeds were soaked in water for a definite period and then sown in field. There was no benefit derived from this treatment as the germination was found to be low with or without pre-soaking.

Effect of depth of sowing.—The seeds were sown at varying depths to determine the effect of depth of sowing on germination. The experiment was conducted in black soil area. The results were as follows :—

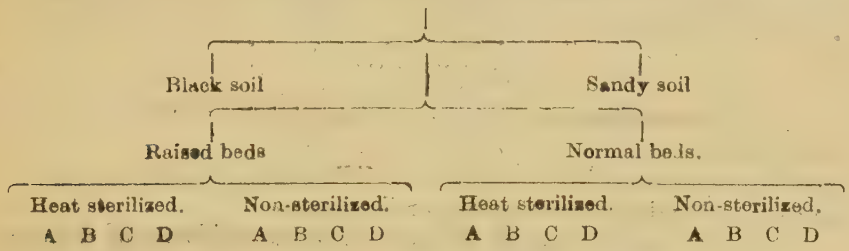
TABLE XVIII.—*Effect of depth of sowing on germination of datura seeds.*

Treatments.			Percentage of germination.
1	Seeds not covered	..	..
2	Seeds sown at a depth of	$\frac{1}{4}''$	
3	Do.	$\frac{1}{2}''$	
4	Do.	$\frac{3}{4}''$	
5	Do.	1″	
6	Do.	$1\frac{1}{2}''$	10
7	Do.	2″	5
8	Do.	5″	4

The optimum depth of sowing was thus found to be $\frac{3}{4}''$ below the soil.

(*g*) *'Damping off' of tobacco seedlings—Field experiments.*—During the year these experiments were carried out in two series at the Agricultural Research Station, Guntur, in black soil and at Bapatla in sandy soil.

Relative efficacy of various treatments.—The object of the experiment was to test the relative efficacy of Bordeaux mixture, Burgundy mixture and home-made colloidal copper, heat sterilization and formation of raised nursery beds in controlling 'damping off'. The experiments were laid out in a split plot randomized design with six replications as per the following scheme :—



B. Bordeaux mixture 1 per cent.
C. Home made colloidal copper 1 per cent.
A. Burgundy mixture 1 per cent.
D. Control.

The fungicides were applied at the rate of five gallons per an area of one cent of nursery. The evaluation of the results was based on the number of healthy seedlings surviving and available for transplanting. In the first series the disease was negligible in the sandy soil but heavy in black soil. In the second series the incidence of disease was high in both soils.

TABLE XIX.—*Relative number of surviving seedlings in different treatments. I Series—Guntur—Black soil area.*

		Treatments.	*Mean number of surviving seedlings in a bed of 3 × 6'.*
Raised ..	Sterilized ..	A. Burgundy mixture	837·8
		B. Bordeaux mixture	714·3
		C. Colloidal copper	580·5
		D. Control	183·8
Do. ..	Non-sterilized ..	A. Burgundy mixture	472·7
		B. Bordeaux mixture	451·8
		C. Colloidal copper	348·5
		D. Control	109·0
Normal ..	Sterilized ..	A. Burgundy mixture	631·5
		B. Bordeaux mixture	745·0
		C. Colloidal copper	542·5
		D. Control	163·7
Do. ..	Non-sterilized ..	A. Burgundy mixture	333·5
		B. Bordeaux mixture	444·8
		C. Colloidal copper	364·2
		D. Control	77·0

TABLE XX.—*Black soil area, Agricultural Research Station, Guntur. II Series—Damped off area expressed in square feet.*

		Treatments.	*Total area damped off in sq.ft.*
Raised bed.	Sterilized ..	A. Burgundy mixture	..
		B. Bordeaux mixture	0·03
		C. Colloidal copper	0·05
		D. Control	90·96

		Treatments.	Total area damped off in sq. ft.
Raised bed.	Non-sterilized ..	A. Burgundy mixture	8·30
		B. Bordeaux mixture	0·45
		C. Colloidal copper	5·80
		D. Control	107·00
Normal bed.	Sterilized ..	A. Burgundy mixture	0·50
		B. Bordeaux mixture	0·34
		C. Colloidal copper	0·07
		D. Control	108·00
Do.	Non-sterilized ..	A. Burgundy mixture	11·50
		B. Bordeaux mixture	5·70
		C. Colloidal copper	17·16
		D. Control	108·00

The results of the two series of experiments in the black soil area show that—

(1) there is no significant difference between the raised and normal beds in the intensity of the disease,

(2) sterilization of beds reduces the incidence of disease significantly,

(3) among the fungicides Burgundy mixture and Bordeaux mixture are equally efficient and superior to Colloidal copper in controlling the disease, and

(4) all the three fungicides are superior to control.

Sandy soil area at Bapatla.—The incidence of 'damping off' in the first series of experiments being negligible, the results were not taken into consideration. There was heavy incidence of 'damping off' in the second series and the results are recorded below :—

TABLE XXI.—*Number of surviving seedlings in the different treatments.*

		Treatments.	Mean number surviving of seedlings per bed of 3 × 4½'.
Raised ..	Sterilized ..	A. Burgundy mixture	360·3
		B. Bordeaux mixture	394·17
		C. Colloidal copper	304·0
		D. Control	25·67
Do.	Non-sterilized ..	A. Burgundy mixture	158·17
		B. Bordeaux mixture	215·83
		C. Colloidal copper	157·33
		D. Control	37·00
Normal ..	Sterilized ..	A. Burgundy mixture	481·0
		B. Bordeaux mixture	548·67
		C. Colloidal copper	545·67
		D. Control	6·50
Do. ..	Non-sterilized ..	A. Burgundy mixture	186·5
		B. Bordeaux mixture	397·0
		C. Colloidal copper	197·0
		D. Control	59·67

The following conclusions can be drawn from the results obtained :—

Conclusions— 1 Sterilized > Non-sterilized.

2 B C A D

388·92 301·01 296·51 32·22

Interaction of the first order.—(1) The interaction between levels of beds and sterilizations, between levels of beds and fungicides are not significant.

(2) The interaction between sterilization and fungicides is significant. Burgundy mixture and Colloidal copper which are on a par with Bordeaux mixture in the sterilized series become significantly inferior to Bordeaux mixnure in the not-sterilized series.

Interaction of the second order.—The interaction between the levels of beds, sterilization and fungicides is not significant.

Optimum strength and frequency of application of fungicides.—Different strengths of the fungicides were used and these were applied at varying intervals to the beds to determine the optimum strength of the fungicides and the frequency of application to bring about the maximum control of damping off. The experiments were conducted in two series at the Agricultural Research Station, Guntur and at Bapatla. At Bapatla the disease was negligible in the experimental area in the first series and consequently the results were rejected. At Guntur there was heavy incidence of ' damping off '. Bordeaux mixture, Burgundy mixture and Collodial copper were used at 1 per cent and ½ per cent strengths. These were sprayed at intervals of 3 days, one week or a fortnight respectively. The results of the experiment are given below :—

TABLE XXII.—*Number of surviving seedlings in various treatments.*

	Bordeaux mixture.		*Burgundy mixture.*	
	1 PER CENT.	½ PER CENT.	1 PER CENT.	½ PER CENT.
(1)	(2)	(3)	(4)	(5)
Spraying once a fortnight ..	425·75	427·50	470·50	365·50
Spraying once a week ..	406·50	344·25	463·5	392·75
Spraying once in three days.	587·5	525·75	513·25	538·0
Mean per bed	475·25	432·5	482·42	435·43

	Colloidal copper.		*Control.*	*Total.*	*Mean per bed.*
	1 PER CENT.	½ PER CENT.			
	(6)	(7)	(8)	(9)	(10)
Spraying once a fortnight ..	304·00	199·50	207·75	2,310·50	330·07
Spraying once a week ..	406·0	358·25	266·50	2,637·75	376·82
Spraying once in three days.	521·00	477·75	144·50	3,307·75	472·54
Mean per bed	377·00	345·17	206·25	.. ..	..

Standard error—35·91.
Critical difference—97·62 (5 per cent).
130·05 (1 per cent).

Conclusions.—Spraying once in three days gives the maximum control. There is no significant difference between spraying once a week or once a fortnight. The fungicides at 1 per cent strength are equally efficient. One per cent is superior to half per cent strength. All treatments are significantly superior to the control.

Economics of the treatments.—The actual financial indications of the treatments for the control of damping off were calculated and are given below. The gain is calculated by the increased net outturn resulting from the sale of seedlings from treated plots after deduction of the cost of treatment.

TABLE XXIII.—*Economics of treatments.*

Treatment.	Gain per acre.
	RS.
1 Bordeaux mixture 1 per cent	2,198
2 Burgundy mixture 1 per cent	2,203
3 Colloidal copper 1 per cent	1,390
4 Bordeaux mixture ½ per cent	1,633
5 Burgundy mixture ½ per cent	1,661
6 Colloidal copper ½ per cent	1,099
7 Spraying once a fortnight	748
8 Spraying once a week	1,154
9 Spraying once in 3 days	2,056

Optimum quantity of one per cent Bordeaux mixture for the control of damping off.—The trials were made at the Agricultural Reasearch Station, Guntur, and at Bapatla in two series using 500, 750 and 1,000 gallons of Bordeaux mixture per acre for each spraying. Since there was no disease in the first series at Bapatla, the results of the second series of experiments at Bapatla and those obtained from the two series at the Agricultural Research Station, Guntur, were taken into consideration. There was no significant difference between the three quantities of the fungicide used in controlling damping off. Therefore 500 gallons can be taken as the most economical quantity to be used.

TABLE XXIV.—*Mean number of surviving seedlings per bed.*

	Bordeaux mixture 500 gallons per acre. A.	Bordeaux mixture 750 gallons. B.	Bordeaux mixture 1,000 gallons. C.	Control D.	Critical difference.	Significance.
II Series Bapatla sandy soil.	184·50	191·33	256·33	32·33	150·32	Yes.
I Series, A.R.S., Guntur (Black soil).	307·17	309·17	351·17	50·33	89·9 (5 per cent). 124·42 (1 per cent).	Do.
II Series, A.R.S., Guntur (Black soil).	308·67	326·00	332·33	51·50	109·75 (5 per cent). 151·77 (1 per cent).	Do.

Conclusions—

Bapatla II Series	C	B	A	D
A.R.S., Guntur I Series	C	B	A	D
A.R.S., Guntur II Series	C	B	A	D

Effect of seed rate on the incidence of damping off.—Four different seed rates, viz., 1¼ tolas, 1 tola, ¾ tola and ½ tola of seed per cent of nursery bed were included in the experiments. These were conducted at Bapatla and at the Agricultural Research Station, Guntur, in two series. In the first series at Bapatla, the disease was negligible. In the second series the 'damping off' was so virulent as to wipe off the seedlings completely. At Guntur the disease was severe in the first series and wiped off all the seedlings in the second series. It was observed that the incidence is almost the same in all the different seed rates.

(*b*) *Mosaic of tobacco.*—Specimens of diseased tobacco plants were collected from different parts of the Circars and used for inoculation experiments on *Nicotiana glutinosa* and *Datura fastuosa* var *alba*. Necrotic lesions developed on these hosts indicating that the virus prevalent in these areas is Nicotiana virus I.

15. *Sugarcane-Mosaic disease—Varietal resistance.*—The varietal resistance test for new canes was pursued with twelve varieties kindly supplied by the Imperial Sugarcane Expert. These were grown inter-stripped between rows of mosaic affected canes of the variety, Co. 213. The percentages of infection in the varieties under trial are taken to indicate the degree of susceptibility or resistance.

TABLE XXV.—*Percentage of mosaic infection.*

Variety.	*Percentage of infection.*
Co. 213	56
601	0
602	40
603	66
604	54
605	26
606	24
607	10
608	46
609	24
610	42
611	46

The range of infection varied between 0 and 66 per cent. Co. 601 remained free. The highest infection was noticed in Co. 603 with 66 per cent which is higher than the control Co. 213. The other varieties may be considered to be more or less susceptible.

III.—War Efforts and Agro-Industries.

16. *Ergot of Rye—Large-scale production of ergot.*—The scheme for the large-scale production of ergot on the Nilgiris was put into operation on the first of April 1944. During the year, 60·83 acres were sown to rye in subvention farms. At the Agricultural Research Station, Nanjanad, about 20 acres were under rye. The whole area was spray inoculated with spore suspensions. A total

of 982 lb. of dried ergot was harvested and advertised for sale in the open market by inviting tenders. Nine hundred and seventy pounds were purchased by an Indian firm of pharmaceutists at a cost of Rs. 14,550. The experience gained in the first year of the scheme has shown that the yield of ergot is entirely influenced by the climatic conditions prevailing at the time of flowering of rye plants. Higher yields are obtained if the weather is humid and misty at the time of flowering. If on the other hand comparatively dry conditions prevail at this critical period, the infection is poor and the yield is consequently small.

In April and May 1945, an area of nearly 63½ acres have been sown with rye in subvention farms. Fifteen acres have been grown with rye at the Agricultural Research Station, Nanjanad.

Research on ergot—Experiment 1—*Manurial trials.*—To determine whether any relation exists between the manures applied and the yield and quality of ergot, an experiment was laid out at the Agricultural Research Station, Nanjanad. Normal and double doses of farm-yard manure, groundnut cake, fish-guano and steamed bonemeal were applied to the soil and compared with no manure. The yields were not satisfactory being poor in all the plots due to climatic influence. Assays of the ergots from the different plots did not show any significant differences in alkaloid contents. The experiment has been repeated this season with some modifications. All the plots have been given a basal dressing of farm-yard manure. Ammonium sulphate and ammonium phosphate have been applied and are to be compared with no-manure. The crop is on the field and flowering has not commenced.

Varietal trials.—Twelve varieties of rye comprising of nine selections kindly supplied by the Imperial Economic Botanist, New Delhi, the local rye which is now known to have been originally brought from Italy, Australian Black Winter rye, and a variety obtained from Kashmir were included in the experiment. The local rye and Australian rye proved the best for the production of ergot. Kashmir rye has a longer duration and the yield of ergot is very poor. The other selections are also of a much longer duration than the local rye and their vegetative growth and flowering habits are not adapted for commercial exploitation.

Suitability of other localities for ergot production.—Experimental sowings were made at Kodaikanal and Kotagiri to find out whether ergot can be successfully produced in other localities besides Ootacamund. It has been found that ergot can be produced satisfactorily at Kodaikanal and at Kotagiri but the sowings will have to be adjusted to suit the local conditions of rainfall. The quality of Kodaikanal ergot has been pronounced to be slightly superior to the Ootacamund produce. A larger area is being grown with rye in these places during the current season.

Isolation of strains with higher alkaloid content.—Taking advantage of the short cut method of assaying the alkaloids of individual ergots evolved by Dr. Mukerji and De of the Bio-Chemical Standardization Laboratory, Calcutta, the samples of the different batches of ergots were assayed at Coimbatore. Wide variations were observed in the alkaloid contents of individual sclerotia ranging between 0·2 and 0·55 per cent. The fungus was brought into pure culture from two sclerotia of 0·49 and 0·55 per cent alkaloid contents, respectively. These are being multiplied on a large scale at Ootacamund and will be utilized for the current seasons spray inoculations.

Natural ergots in the Province.—Further search has revealed the occurrence of ergot on 3 more new grass hosts in the Province. They are *Panicum maximum*, *Digitaria wallichiana* and *Themeda cymbaria*. The sclerotial and sphacelial stages were present on these hosts. Thus till now 21 hosts of *Claviceps sp.* have been recorded in this Province alone.

17. *Food Yeast—Researches on conditions for optimum production—Influence of pre-treatment of molasses on yield of yeast.*—A comparative study was made on the relative merits of clarified and unclarified molasses on the production of Torula yeast. It was found that there was a slight increase of the weight of yeast resulting from the use of clarified molasses.

It was suspected that the impurities in the molasses might inhibit the growth of yeast and in order to minimize these, molasses were treated with $H\ SO_4$ and steamed for 15 minutes or boiled with superphosphates and treated with liquor ammonia to precipitate heavy metals as hydroxides. Poor yields were obtained with the former treatment. There was an increase of 1 per cent of yield with the latter method of clarification but this increase does not compensate the extra cost and labour involved. Sugar is manufactured by the carbonation process or sulphitation process. Molasses obtained from factories adopting these different processes were compared but there was no difference in yield of yeast.

Variations in the period of fermentation and effect on yield of yeast.—A number of experiments were conducted to note whether any alteration in the duration of the fermentation period affected the yield of yeast. The following results were recorded :—

(1) If the supply of molasses to 40 gallons of wort is kept at the level of 25 lb., it was found that the yield of yeast was more or less equal when the aeration is continued for 6, 8 or 16 hours.

(2) But with the addition of further quantities of molasses, a proportionate increase in the yield is obtained with the increase in the duration of aeration. The dry weight of yeast usually ranges between 10 to 12 per cent of the weight of the sugar supplied.

(3) The quantity of air supplied during aeration was varied by using blowers capable of giving out 1½ c.ft., 2½ c.ft. and 80 c.ft. of air per minute. The quantity of yeast obtained remained at

about the same level in all indicating that the increase in the quantity of air above 1½ c.ft. per minute does not influence the production of yeast in any appreciable degree.

(4) A slight modification was effected in the aerator in use by enclosing the arms of the aerator at the bottom of the tank in cloth bags in order to reduce the size of the bubble and enable them to diffuse more uniformly throughout the medium, than when the arms are uncovered. An increase of 10 per cent of yeast over the control was obtained. This indicated that the use of air in small bubbles results in an increase of yield.

Effect of height of column of wort on yield.—Equal quantities of wort were kept in tanks of different diameter so that the column of liquid was 3½ feet and 8 feet in height and aerated to observe the effect of the height of the columns of liquid through which aeration is conducted on the yield of yeast. There was no difference in the yields obtained from the two tanks.

Maintenance of the pH at a constant level of about 4·8.—Workers in England recommend that the shifts in the pH towards the acid side during the fermentation, due to the accumulation of acids produced is to be neutralized by the addition of liquor ammonia—a costly material under Indian conditions. Trials were conducted with various alternative substances. It was eventually discovered that ammonium carbonate can be used with increased advantage. Four hundred c.c. of a 10 per cent solution were sufficient for a day and this increased the yield of yeast by about 16 per cent over the liquor ammonia method. Furthermore the cost of ammonium carbonate necessary for a day is only about one-eighth that of liquor ammonia. The solution of ammonium carbonate was allowed to drip continuously into the wort at a definite rate and these processes worked successfully in maintaining the pH at practically the same level.

Phosphate content of wort and yield.—The quantity of phosphate added to the wort was varied from double the usual strength to 50 per cent of the normal quantity without any significant change in the quantity of yeast formed.

Vitamin contents of yeast produced under different conditions.—Samples of food yeast grown in wort which had received different treatments detailed below were sent to the Director, Nutrition Research Laboratories, Coonoor, for the assay of vitamin contents. The results are furnished below :—

TABLE XXVI.

Particulars.	*Thiamin per cent per gram,*	*Nicotinic acid.*
Yeast from wort where liquor ammonia was used to adjust pH.	17·2	215·1
Yeast from wort where ammonium carbonate was used.	28·8	165·9
Yeast from wort as in 2 to which 500 grams of steamed malt culms were added.	26·4	182·1

Yield from Torulopsis utilis var *major.*—This strain which is reputed to give higher yields was obtained through the help of the Imperial Mycologist and grown on molasses wort in the laboratory. The yield was only equal to the old strain.

Estimation of alcohol production by Torulopsis utilis.—In order to estimate whether any alcohol is produced by the organism during fermentation, samples of the wort were drawn off from the tank at intervals of two hours and the alcohol content estimated with the kind co-operation of the Government Agricultural Chemist. Even at the end of the day's fermentation, the alcohol content of the wort never rose above 1·2 per cent.

A total quantity of 261 lb. produced from the laboratory plant was strictly rationed out among a host of *bona fide* consumers.

IV.—Scheme for Scientific aid to Cardamom Industry in South India.

A scheme partially financed by the Imperial Council of Agricultural Research and sanctioned at the beginning of the official year was put into operation on 1st October 1944. The scheme is worked partly at Singampatti and partly at Valparai. The Cardamom Specialist has his headquarters at Singampatti. At this place the botanical aspects of selection and breeding are being planned together with a study of the fungus diseases occurring in the nursery and the field. The Entomological aspect of the scheme is being worked out at Valparai by the Assistant Entomologist.

The investigations are being conducted on the lines of the technical programme of the scheme approved by the Imperial Council of Agricultural Research. A number of types collected from different parts of South India are being grown at Valparai to observe their behaviour and reaction to insect infestation. It is proposed to propagate these types at Singampatti from seeds so as to avoid introduction of any disease through the rhizome to this area.

V.—Survey of the Pollu Disease of Pepper and the Wilt Disease.

A scheme sanctioned for this purpose was commenced on 16th June 1944 and ended on 15th December 1944. The survey was conducted by an Assistant Mycologist. The important pepper growing areas in Malabar, Cochin, Travancore, Mysore, Coorg and North Kanara were visited. A separate report on this scheme has been submitted.

The Pollu disease was not much in evidence this year. Only a low incidence was oberved in North Malabar and the adjoining areas of South Kanara. 'Anthracnose' of pepper caused by *Colletotrichum necator* was noticed in a small degree in all the places visited.

The incidence of wilt disease was low, though in evidence in all the tracts. A number of fungi were isolated from the roots of the diseased plants, the more common among them being *Rhizoctonia solani*, *Diplodia sp.*, *Colletotrichum sp.* and *Pythium sp.*

Important varieties of pepper cultivated in the several tracts were collected and planted at the Agricultural Research Station, Taliparamba, for further studies. A special study was made of the system of cultivation in vogue in the various pepper tracts and on the method of providing shade to the vines.

VI.—Plant Quarantine—Legislative Measures.

Plants and specimens intended for export outside India by various parties were examined for freedom from diseases and thoroughly disinfected whenever necessary. The necessary certificates were also issued.

The Madras Agricultural Pests and Diseases Act continued to be administered in the Province in respect of the following diseases :—

(1) *Budrot of palmyra and coconut palms.*—The Act was in force in the districts of West Godavari, East Godavari, Krishna and parts of Guntur and Malabar districts.

West Godavari.—A special staff consisting of one special deputy tahsildar, two revenue inspectors, one clerk and seven maistris and four peons were engaged in this work.

East Godavari.—The special staff engaged in this work consisted of 10 revenue inspectors, 10 maistris and 10 peons.

Krishna.—The Act was in force in the taluks of Bandar, Divi and Vijayavada and the special staff of 3 revenue inspectors, 2 maistris and 3 peons were engaged.

Guntur.—Repalle and Tenali taluks were the notified areas in this district. A staff of one special revenue inspector and two maistris were employed.

Malabar.—Palghat, Ponnani and Walluvanad taluks comprised the notified areas. The special staff consisted of 1 sub-assistant in Mycology, 1 revenue inspector, 3 demonstration maistris and 3 peons, but the number has since been increased to 3 special revenue inspectors, 9 maistris and 3 peons.

(2) *Broom rape of tobacco.*—This Act was enforced in the districts of Guntur, Krishna, West Godavari, East Godavari and Nellore. A special staff of 1 District Agricultural Officer, 1 upper subordinate, 2 clerks, 22 fieldmen and 66 maistris were employed by the department for the eradication of this parasite.

(3) *Wheat rust.*—The Act was in force for the months of April to September 1944. Though the Act was to have been enforced in 1945 April-September according to the original sanction, it was withdrawn in April 1945.

(4) *Sugarcane smut.*—The Act is to be enforced in 34 villages of Hospet taluk, Bellary district, for 4 months from June to September during 1944, 1945 and 1946. A special staff of 3 maistris has been sanctioned for this purpose and these will work under the Agricultural Demonstrator, Hospet.

(5) *Cardamom mosaic.*—This Act continued to be in force during the year in the Nelliampathy hills in Palghat taluk of Malabar district for the purpose of preventing the entry of mosaic disease of cardamoms in this area which is free from the disease. At the request of the local Planters' Association the notification has been extended for a period of three years till March 1948.

(6) *Spike disease of sandal.*—This Act was in force in Hosur and Dharmapuri taluks of Salem district and administered jointly by the Forest and Agricultural departments.

VII.—Propaganda.

The section was represented in several exhibitions and shows. The more important among these were the Mahamakam Exhibition at Kumbakonam, the War Services Exhibition at Mathurai, and the Horticultural Show associated with the Golden Jubilee celebration of the Nilgiri Agri-Horticultural Society.

I gave a talk on "Micro-organisms in the Service of Humanity" to the Botanical Association of the Presidency College, Madras.

Contributions were made to the Journal "*Mezhichelvam*" and published by the department on the following subjects :—

(1) Short songs on crop diseases.

(2) Leaf fall and fruit rot of orange.

(3) Blast of paddy.

(4) Foot rot of paddy.

(5) "Damping off" of tobacco, tomato and chillies.

(6) Tikka leaf spot of groundnuts.

(7) Mahali disease of arecanuts.

(8) Sugarcane redrot.

(9) Mildew on mango.

(10) Mildew on grape.

(11) Citrus canker.

(12) Powdery mildew of citrus.

VIII.—Teaching.

Thirty-five lectures and 31 practical classes were held for the students of B.Sc. III. A batch of military officers was given a lecture on the symptoms, cause and control of plant diseases. This was followed by a demonstration. Two batches of sepoys had short courses on plant diseases and their control. Nine classes of three hours each were conducted in the vernacular. Two lantern lectures were delivered at the regimental centre, Madukarai.

IX.—Advisory.

Sixty specimens were received for examination. These were reported upon and suitable remedial measures recommended.

X.—Grow More Food.

Sorghum anti-smut campaign.—With a view to obviate the loss caused by smut of sorghum and thus increase the production of sorghum grain, a scheme was sanctioned by the Government to purchase and distribute finely powdered sulphur for seed dressing of sorghum seeds. Despite the transport difficulties 40 tons of sulphur were purchased and arrangements have been made to distribute sulphur to the ryots through the department in the districts. During the last season 7,484 lb. were sold to the ryots, capable of treating seeds enough to sow 166,723 acres. A larger area could not be covered owing to the delay in the transport of sulphur to the distribution centre. During the present season, it is hoped that a larger area will be sown with treated seeds.

Edible mushroom.—The cultivation of *Volvaria diplasia*—the paddy straw mushroom—was continued and demonstrations of the method of cultivation were conducted at the Government House, Guindy, the Agri-Horticultural gardens, Madras, and the regimental centre at Madukarai. There is a continuous demand for the spawn of this mushroom and 177 bottles of spawn have been sold in the Province and outside. The demand for the spawn is on the increase.

An indigenous edible species of *Collybia* growing wild in the pine forests of Kodaikanal was collected, and brought into pure culture. Attempts are being made to grow this species at Ootacamund.

XI.—Microtome Sub-Section.

One hundred and fourteen materials were received during the year and 121 inbedded. Five hundred and fifty-five slides were prepared and supplied to different workers in the department.

XII.—Miscellaneous.

1. *Agri-tree-killer solution.*—There has been a continued demand for this useful remedy against unwanted trees from the public. Eighteen gallons were sold to the different clients during the year. Some of the requests could not be complied with for some time owing to the non-availability of one of the ingredients. But since then fresh supplies have arrived and the preparation of the solution has been resumed.

2. *Bapatla Agricultural College.*—In order to equip the second Agricultural College started within the Province with necessary apparatus and specimens, all the essential requirements were selected from the stock available in the section and despatched to Bapatla. This has entailed a certain amount of self denial in sharing with the more needy the meagre facilities at Coimbatore during a period of war.

3. *Supply of cultures.*—Stock cultures of various fungi were supplied to the Imperial Mycologist, Provincial Mycologists, and educational institutions both in India and Ceylon. In addition, specimens of diseased plants were also sent to the Imperial Agricultural Research Institute.

XIII.—Publications.

The following contributions were made from the section :—

(1) The Natural Occurrence of Ergot in South India I. By K. M. Thomas, T. S. Ramakrishnan and K. V. Srinivasan. *Proc. Ind. Acad. Sci.*, 1945.

(2) The Natural Occurrence of Ergot in South India II. By the same authors (in the press).

Acknowledgments.—Despite the frequent changes of staff and paucity of staff caused by two posts of assistants remaining unfilled, the members of the section continued to give me unstinted co-operation. They enabled me to keep up the standard of work turned out by the section. My thanks are due to all my colleagues in the Institute and my subordinates for their co-operation and assistance.

Coimbatore,
13*th August* 1945.

K. M. THOMAS,
Government Mycologist.